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Abbreviations

CD	– Chart Datum
CS	– Continental Shelf
CZ	– Contiguous Zone
EEZ	– Exclusive Economic Zone
HAT	– Highest Astronomical Tide
HHW	– Highest High Water
HW	– High Water
IHB	– International Hydrographic Bureau
IHO	– International Hydrographic Organisation
ILC	– International Law Commission
INT chart	– chart of the International Chart Series (*i.e.*, produced in accordance with International standards defined by the IHO)
LLW	– Lowest Low Water
LW	– Low Water
LAT	– Lowest Astronomical Tide
MHHW	– Mean Higher High Water
MHHWS	– Mean Higher High Water Springs
MHLW	– Mean Higher Low Water
MHW	– Mean High Water
MHWN	– Mean High Water Neaps
MHWS	– Mean High Water Springs
MLHW	– Mean Lower High Water
MLLW	– Mean Lower Low Water
MLLWS	– Mean Lower Low Water Springs
MLtLWS	– Mean Lowest Low Water Springs
MLW	– Mean Low Water
MLWN	– Mean Low Water Neaps
MLWS	– Mean Low Water Springs
MSL	– Mean Sea Level

TALOS Manual	– A Manual on Technical Aspects of the United Nations Convention on the Law of the Sea – 1982
TR	– Technical Resolution of the IHO
TS	– Territorial Sea
UNCLOS	– United Nations Convention on the Law of the Sea 1982

The Importance of the Tidal Datum in the Definition of Maritime Limits and Boundaries

Nuno Sérgio Marques Antunes

1. Introduction

The periodical rise and fall of oceanic waters in coastal areas – the tides – is a phenomenon that has been observed for centuries. However, their practical effects concerned only seamen and those whose life was somehow directly related to the sea. The relevance of the tidal phenomenon in the international law of the sea only emerged recently. This has been simultaneous with other developments occurring in the twentieth century, namely the appropriation of vast oceanic areas by states and the need to define the spatial limits of their jurisdiction at sea.

The existence of tides and their effects were taken account of in the United Nations Convention on the Law of the Sea (hereinafter UNCLOS or LOS Convention) as well as in the 1958 Convention on the Territorial Sea and the Contiguous Zone (hereinafter TS Convention). References are made therein to concepts such as *"low-water line"*, *"low-tide elevations"* and *"high tide."* These concepts play an important part in establishing the limits of state jurisdiction over maritime zones. The accurate definition of these lines and features, nonetheless, is dependent upon the tidal datum adopted in a particular area. To discuss how significant the tidal datum may be in the unilateral definition of maritime limits, as well as in maritime boundary delimitation, is the purpose of this text.

To begin with, some elementary notions related to tides will be provided. The concept of tidal datum will then be introduced, and its relationship with nautical charts examined. The relevant provisions of UNCLOS will be analysed. Special emphasis will be placed upon the importance of tidal datums to the interpretation of these provisions. Finally, examples of state practice and jurisprudence in this matter will be examined in order to determine whether there is a *"more suitable"* or legally binding tidal datum.

2. Tides: Elementary Notions

2.1 The Tidal Phenomenon

Tides are complex phenomena that can be perceived as horizontal and vertical movements of oceanic waters in littoral areas. The horizontal movements are known as *currents* or *tidal streams*. Although they are absolutely crucial to comprehend the tidal phenomenon in detail , for the purposes of this study they may be deemed to be non-existent. This analysis will concentrate upon the vertical change of the level of oceanic waters, which has been referred to simply as the *tide*.

The International Hydrographic Organization (IHO) defines a *tide* as a *"periodic rise and fall of the surface of the oceans…due principally to the gravitational attraction of the Sun and the*

Moon on a rotating Earth."[1] The accurate description of all facets of this phenomenon requires deep mathematical investigations, and the knowledge of, *inter alia*, the motions of the sun and moon, the interaction with the physical characteristics of water basins, and the effects of meteorologic factors. Such an approach is however not needed to carry out the proposed analysis. This paragraph will only allude to some elementary notions that are required to comprehend the role of tidal datums in the definition of the maritime jurisdiction of states.

Tides are *periodical oscillations* of the water surface, that is, vertical movements of water that take place at regular intervals. This oscillation is due mainly to the *attractive forces of the sun and the moon*. These forces *vary periodically* as a result of the apparent motions of the sun and the moon around the earth. The way in which these attractive forces interrelate with the *earth's rotation movement* determines the generation of tides. It must be borne in mind that tides will differ around the globe, not only as a consequence of different generating forces at each place, but also due to specific local and regional factors.

A simple drawing may perhaps help to explain the elementary notions of tide generation. It must nonetheless be emphasised that this representation is too simplistic to be perceived as a complete description of reality. If one assumes that the earth has no land masses, and that the water mass will react instantaneously to generating forces while maintaining their gravitational properties, two key ideas may be illustrated by Figure 1.[2] First, it is clear that the influence of the moon is in principle bigger that that of the sun. This happens because the forces generated by these two celestial bodies vary not only with their mass but also in the inverse proportion of the square of the distance to the earth, and the moon is much closer to the earth than the sun. The magnitude of the forces generated by the sun are usually less than half those of the moon. However, there are areas where the solar influence is dominant in the tidal pattern. Secondly, it is possible to conclude that the changes in the water mass depend upon the relative position of the sun and the moon. The maximum variation occurs when the forces resulting from the sun and the moon 'pull' in the same direction.[3]

Things become much more complex when account is taken of the apparent motions of the sun and the moon caused both by the earth's orbital movement around the sun, and its rotation about its axis. The rotation of the earth will give rise to an apparent motion of the sun and the moon around the earth. As a result, tide generating forces at a certain point change slowly but continuously throughout the day. When considering latitude, it is easy to see that the forces generated by the sun and the moon will be different along a certain meridian. Therefore, at each moment in time the generating forces differ from place to place.

To understand the effects of the orbital movement of the earth, it is useful to imagine a celestial sphere of infinite radius with its centre on the earth, and imagine also that the motions of the sun and the moon are depicted thereon. As a result, other factors that are relevant to tide generation come to light. In this framework, the sun 'moves around' the earth along a plane that is known as *ecliptic*, and which is inclined about 23.5° in relation to the plane of the equator. To complete a revolution around the earth, the sun takes one mean solar year. During that period, whereas small

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1 IHO, 1993: 27; 1994: 247.

2 This figure shows the earth seen from a point directly above one of the poles, that is, from a vertical position in relation to the poles, on earth's axis of rotation.

3 Although the example given is one of a *new moon* (the sun and the moon on same side of the earth – conjunction), the same occurs in situations of a *full moon* (the sun and the moon on opposite sides of the earth, but still in the same plane – opposition).

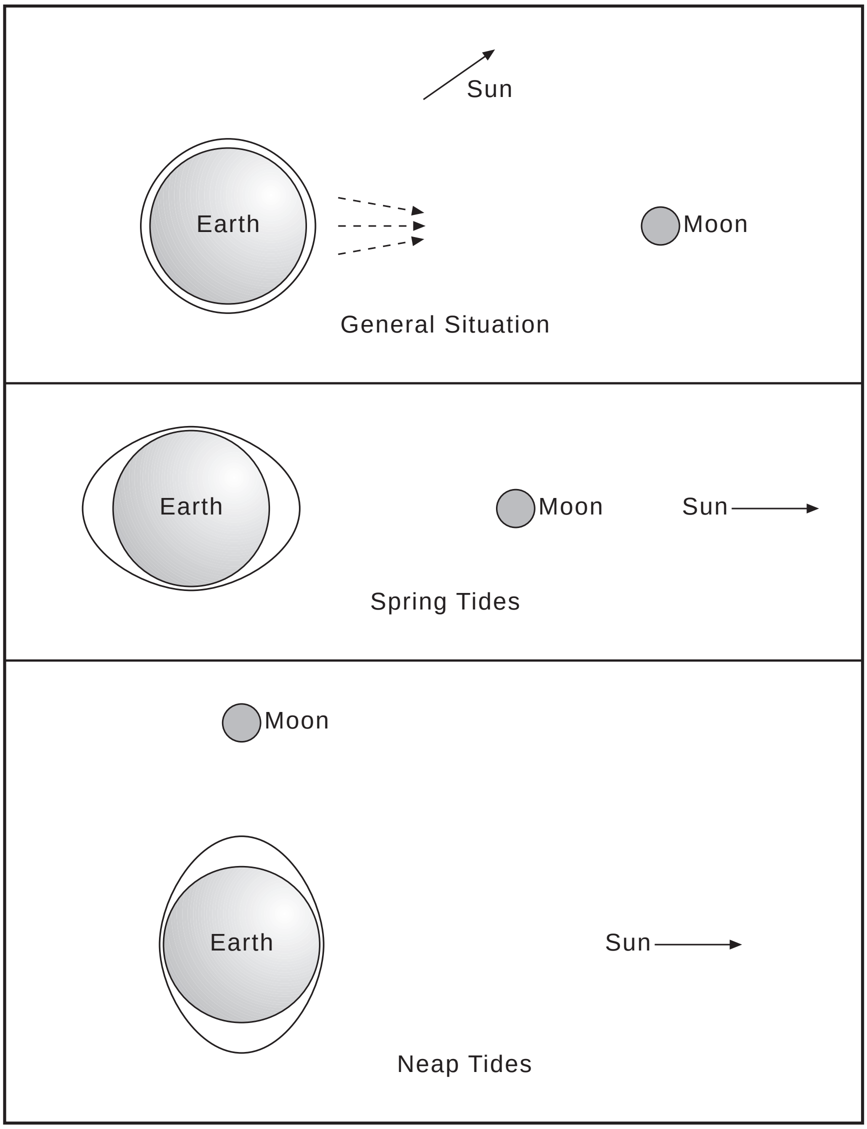

Figure 1: Tide Generation

departures of its position in relation to the ecliptic (celestial latitude) are negligible, the distance to the earth varies giving rise to annual variations of the sun's tide generating forces.

A complete revolution of the moon about the earth takes a little more than 27 mean solar days. While revolving around the earth, the moon oscillates in latitude to the north and to the south of the ecliptic in a period that being more than 27 mean solar days is slightly less than the revolution period. This gives rise to a phenomenon called *regression of the lunar nodes*, which has a period of 18.6 years approximately. These temporal and spatial variations in the positions of these bodies in relation to the earth, especially of the moon, bear upon the tidal phenomenon because they result in different tide generating forces.

Other elements also have to be considered. The actual rotation of the earth, which gives rise to different forces that must be accounted for when studying water movements on earth, is one element. Another is the interaction of the tide generating forces with distinctive physical characteristics of water basins, in particular in shallow waters and channels. In some cases, this element is of an utmost importance in the tidal phenomenon. Meteorology, in the form of wind and barometric pressure, may also interfere with the actual tide at a certain place. However, the influence of this element cannot be predicted with an acceptable degree of accuracy.

In short, the actual oscillation of the water surface may be described by a complex result of several contributions with different periods (known as 'harmonic constituents'). Tides are normally classified, taking into account their patterns, as diurnal, semidiurnal and mixed. Within the different harmonic constituents it is possible to devise *diurnal* (one day period) and *semidiurnal* (half a day period) oscillations caused by both the sun and the moon. The existence of *quarter-diurnal*, *sixth-diurnal* and *eighth-diurnal* oscillations is not uncommon in shallow waters. Other oscillations with periods of more than one day, which are called *long period oscillations*, include some periods that range from approximately 14 days (half a revolution of the moon in the ecliptic) up to approximately 19 years (the period of regression of the lunar nodes).

2.2 Terminology

The highest level reached by the water surface in one complete oscillation is known as *high water*. Similarly, the *low water* refers to the lowest level reached by the water surface in one oscillation. In most littoral areas of the Atlantic Ocean, the semidiurnal regime is prevalent. There are two low waters and two high waters in each day (tidal day). However, this is not a rule applicable throughout the world. In other places, such as the Gulf of Mexico and the Gulf of Tonkin, the regime is mostly diurnal. In the majority of cases there is only one low and one high water per day.

The *height of tide* is the vertical distance from a specified datum (in most cases the chart datum) to the level of the water surface at any time. The height of tide is usually a positive value. Negative values may nonetheless occur when the adopted datum is not low enough to take account of extreme low waters. It is also possible to refer the tide to the *mean sea level*, that is in relation to the average height of the surface of the sea. The height of the tide obtained thereby will be either negative (as in the case of low-waters) or positive (as in the case of high-waters).

The *range of tide*, that is, the difference in height (elevation) between consecutive high and low (or low and high) waters at one place, is variable. The terms *spring tides* and *neap tides* refer to the cases when the value of the range of tide is maximum and minimum respectively, which happens at periods of approximately 14 days. While spring tides occur near every new and full moon, neap tides occur near any of the two situations of quadrature.

3. Tidal Datum and Nautical Charts

3.1 The Notion of Tidal Datum

In a strict sense, a *tidal datum* can be understood as the reference plane (or surface) to which the height of the predicted tide is referred. Two further concepts derived from this may be advanced:

(a) the *sounding datum*, defined as *"the plane to which soundings are reduced in the course of a hydrographic survey"*;[4]
(b) the *chart datum* (CD), defined as the *"plane of reference to which all charted depths and drying heights are related."*[5]

Due to technical considerations, the CD may or may not be the same as the sounding datum. In general terms, it may be said that the datum selected is more or less an *arbitrary level.*[6] Nonetheless, three considerations need to be taken into account when selecting a datum. First, it *"should be low enough for the navigator to be confident that, under normal weather conditions, there is always at least as much depth as is shown on the chart."* Second, it *"should not be so low that it gives an unduly pessimistic idea of the least depth of water likely to be found."* Finally, it *"should be in harmony with the data of neighbouring surveys."*[7]

Sounding and chart datums are low water datums, that is, they refer to the level of the water surface at low tide. Nonetheless, there are also datums based on high water levels. But they are not used as a reference level for depths in hydrographic surveys and nautical charts. These two different datums may be included in the broader category of *vertical datum*, which comprises any plane or surface used as a reference to measure vertical distances (such as depths, drying features, heights on shore, etc.). Any *tidal datum* is thus a vertical datum.

Tidal levels (either high water or low water datums) have several definitions, depending on the information used to compute them, that is, they vary in accordance with the parameters that were considered in their calculation. The existence of different definitions means that, when referring to high water or low water, attention must be drawn to the tidal reference being used. One may refer, for example, to mean levels – Mean Low/High Water (MLW, MHW), to mean levels considered jointly with the range of tide – Mean Low/High Water Springs/Neaps (MLWS, MHWS, MLWN, MHWN), to astronomical levels – Lowest/Highest Astronomical Tide (LAT or HAT), or to more empirical levels – Lowest/Highest Low/High Water (LLW, HHW). Brief definitions of the most commonly used tidal levels are presented in Appendix 1.

3.2 The Tidal Datum Adopted by the International Hydrographic Organization

Amongst others, one of the objectives of the International Hydrographic Organization (IHO) is *"to bring about...the greatest possible uniformity in nautical charts."*[8] Hence, it plays a major

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[4] Admiralty Tidal Handbook, No. 2: 1; O'Connell, 1989: 174.

[5] *Chart Specifications of the IHO and Regulations of the IHO for International (INT) Charts*, Specification 405 (Chart Datum), at pp. 1-400.5.

[6] Fernandes, 1967: 564; Admiralty Tidal Handbook, No. 2: 1.

[7] Admiralty Tidal Handbook, No. 2: 1. Further technical considerations (regarding the use of data in hydrography), which are outside the scope of the present *Briefing*, are discussed in this publication.

[8] Article II(b) of the Convention on the International Hydrographic Organization.

role in defining the technical rules and specifications that guide the production of nautical charts. Insofar as UNCLOS makes explicit reference to nautical charts when alluding to tidal levels, it becomes important to indicate the concepts and definitions that are adopted by the IHO.

The correlation between the tidal datum and the vertical datum used in nautical charts (the CD) is established by the Technical Resolution (TR) A2.5 of the IHO, which refers to *"Datums and Bench Marks."*[9] It states, in paragraph 3, *"that the datum of tide predictions shall be the same as the chart datum (datum for sounding reduction)."* This relationship is confirmed by Chart Specification 405.5 – *"Tide tables and chart datum"*,[10] which asserts that *"whatever CD is used, it is essential that it is the same as the datum adopted for the predictions given in the authoritative Tide Tables."* Until 1997, the same paragraph 3 presented a definition of CD establishing that it should be *"a plane so low that the tide will not frequently fall bellow it."* Any of these definitions seems to indicate that there is some freedom of choice in the adoption of CD.

In 1996, the International Hydrographic Bureau (IHB)[11] proposed an amendment to TR A2.5 for the *"introduction of a precise definition of an international low water datum (Chart Datum)"*,[12] which was approved at the beginning of 1997 by member states.[13] The CD adopted presently by the IHO, for all the places *"where tides have an appreciable effect on the water level"*, is the Lowest Astronomical Tide (LAT).[14] However, there is a proviso stating that in places *"where the tidal range is not appreciable, i.e. less than about 0.3 metre, CD may be the mean sea level."*[15] It may be further noted that the 1997 amendment to TR A2.5 contained also a reference to the high water datum. The Highest Astronomical Tide (HAT) was proposed for adoption as the common high water datum. This level was intended to become the reference *"for vertical clearances where tides have an appreciable effect on the water level."*[16] These concepts demonstrate, quite clearly, that the main concern of the IHO recommendations as regards nautical charts is to ensure safety of marine navigation.

3.3 Tidal Datums and State Practice

Referring to the reasons that explain the differences between chart datums, Kapoor and Kerr note *"administrative and national legislative constraints"* and *"the fact that the tidal phenomenon varies in different localities of the world, with the result that no single formula will satisfy all tidal régimes."*[17] Disregarding the internal legislative and administrative issues, which may in

9 Resolutions of the International Hydrographic Organization.

10 Chart Specifications of the IHO and Regulations of the IHO for International (INT) Charts, at pp.1-400.6.

11 The International Hydrographic Bureau is the main organ of the IHO, and it is responsible *"for the fulfilment of the objects"* of the organisation (article VIII of the Convention on the International Hydrographic Organization).

12 Circular Letter 30/1996 of 15 May 1996, of the IHB.

13 As described in Circular Letter 25/1997 of 13 June 1997, of the IHB.

14 TR A2.5 paragraph 3(a) of the IHO. In a publication entitled *IHO Standards for Hydrographic Surveys* (known as *"S-44"*) the IHO recommends that tidal observations are *"related both to a low-water datum (usually LAT) and also to a geocentric reference system, preferably the World Geodetic System 84 (WGS84) ellipsoid"* (p.11, para.4.2).

15 Chart Specifications of the IHO and Regulations of the IHO for International (INT) Charts, Chart Specification 405.2, at pp. 1-400.5.

16 TR A2.5 paragraph 3(b) of the IHO.

17 Kapoor and Kerr, 1986: 17.

many cases be overcome through agreement, a number of other reasons can be put forward to explain the existence of different CD (LW datum).

To begin with, it must be emphasised that, being an organisation that is only of a consultative and purely technical nature, the IHO cannot impose any resolutions on its member states. Therefore, the implementation of the IHO rules is left to the discretion of each state. The adoption of LAT by the IHO as the recommended common low water datum, has no legal binding force under international law. Secondly, when defining a CD, geographical considerations of the area concerned (such as the tidal regime) have to be carefully weighed, justifying in many cases the use of different datums. Norway, for instance, although supporting the adoption of LAT as CD, expressly remarked the necessity of exceptions for *"certain areas where particular tidal conditions prevail."*[18] These exceptional circumstances are covered by the wording of TR A2.5, paragraph 3(a), which states that the *"chart datum may be adapted"* in accordance with specific needs. Lastly, the tidal information available does not always have the required degree of accuracy, thus raising difficulties with the calculation of LAT. In these cases, the CD is normally selected very low, in order to ensure that the water will not fall below that level and that, consequently, the depths shown on charts are close to the minimum depth that the mariner will actually find.

With regard to the HW datum, similar considerations justify the use of a different tidal datum. The contrast exists insofar as the low water datum is related to charted depths whilst the high water datum concerns, for instance, vertical clearances to bridges and heights ashore. Identically, exceptions are also made for certain specific cases, provided that the differences between datums are shown on nautical documents.

In 1995, the IHO presented a summary of the member states' tidal datums, as a part of the study to establish a *"Global Vertical Reference System"*, pointing out some of these differences and indicating that, as CD;[19]

(a) Germany used MLWS for the North Sea, Normal-Null (NN) for the Western Baltic and close to NN for the Eastern Baltic;
(b) Australia, the United Kingdom (UK) and New Zealand used LAT (the former still had some older charts in Indian Spring Low Water, by then being converted to LAT);
(c) France used mainly Lowest Low Water or below;
(d) Japan used *"nearly Lowest Low Water (close to Indian Spring Low Water)"*;
(e) the Netherlands used MLLWS;
(f) Belgium used MLtLWS;
(g) Norway used MSL, *"minus the sum of certain harmonic constituents"*; and,
(h) the United States of America (USA) used mainly MLLW.

Differences in vertical datums must be duly acknowledged by states, so that users of their charts may be aware of what to expect.[20] On average, they may be deemed to amount to fractions of a metre. The approximate differences (in metres) between the LAT and the national CD levels adopted by the member states of the North Sea Hydrographic Commission are shown in Figure 2.

18 Circular Letter 25/1997 of 13 June 1997, of the IHB, at p. 3.
19 Circular Letter 26/1995 of 16 June 1995, of the IHB, which includes in annex A chart data from 22 countries.
20 TR A2.5 paragraph 3 (a) of the IHO adds *that "differences between LAT and national chart data may be specified on nautical documents."*

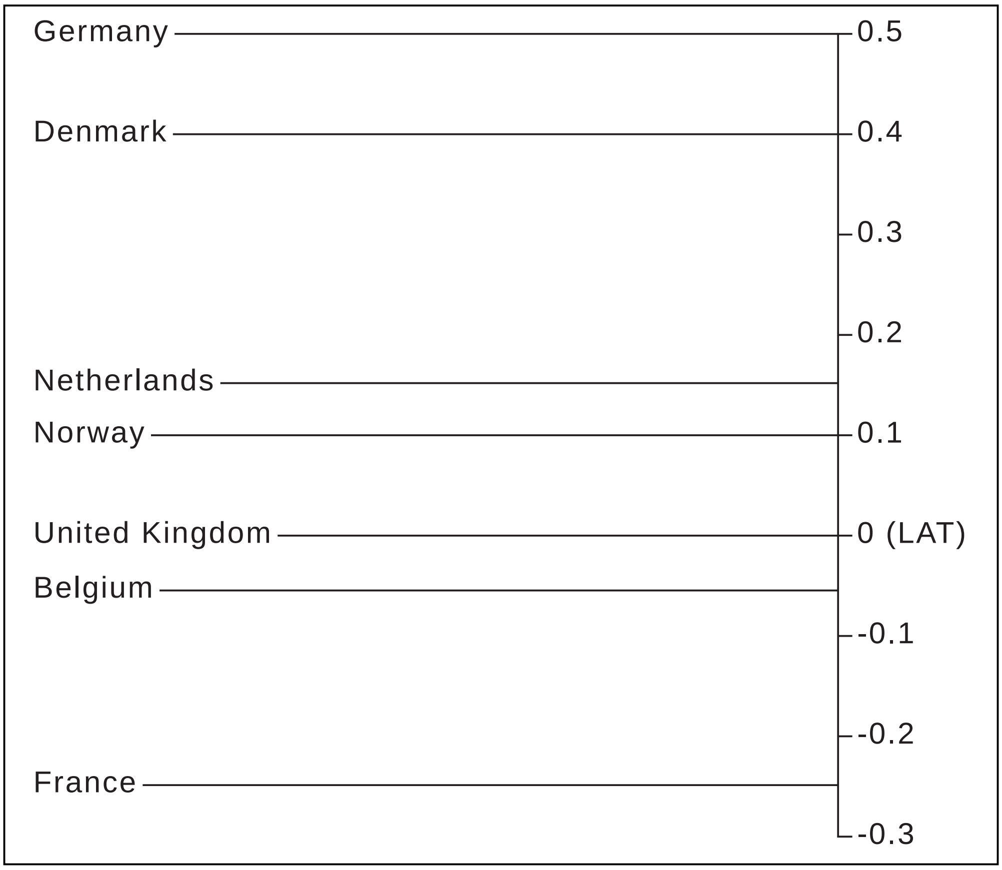

Figure 2: Average National CD Levels

These values are referred to 1997. Following the IHO recommendation to use the LAT as CD, many states have been converting their cartography by introducing the LAT as CD.

The INT 1 Chart, named *Symbols and Abbreviations used on Charts*, published by national hydrographic offices, may be seen as a guide to the interpretation of national and INT charts. Thus, it also includes reference to *"tidal levels and charted data"* adopted for national charts. Appendix 2 shows four examples of symbol IH 20 embodied in certain INT 1 Charts, describing the chart datum and the HW datum used in British, French, German and Portuguese national charts respectively.

Taking all of this into consideration, one very important point has to be made. It is clear that, as far as the use of tidal datums is concerned, no settled, extensive and virtually uniform state practice has until now emerged. So much so, in fact, that states may adopt more than one datum along their coasts; the tidal datum used in one part of the coast does not necessarily have to be used in another stretch of the coast. Such decisions depend solely on technical assessments. In principle, the choice between different vertical datums in nautical charts is based on considerations regarding the safety of navigation.[21] For this reason, the use of nautical charts for purposes other than navigation, for example, in the definition of maritime limits or in maritime boundary delimitation, must always take this fact into account. Furthermore, because there is no general practice upon which to hinge an *opinio juris* in this matter, it does not seem possible to

21 As stated by O'Connell (1989: 174), *"the principal concern of the mariner being the depth of water under the keel."*

identify any customary rule. However, it must be kept in mind that this situation may change in the future, as a result of the recent adoption of LAT and HAT (as CD and HW datum) by the IHO.

4. The Impact on Maritime Limits

4.1 Introductory Remarks

To investigate the relevance of vertical datums under UNCLOS, and how they may become important in the definition of maritime limits is the next step of this analysis. To begin with, it must be remembered that the references to these technical issues can be traced back to the 1930 Conference on the Codification of International Law. The document *Basis of Discussion No. 6* incorporated a proposal for the determination of the baseline from where to measure the breadth of the territorial sea. In the preceding observations, attention was drawn to the different meanings that the expression *"low water"* could have.[22] Moreover, it was apparently by then that the differentiation between islands and low-tide elevations, based on a definition related to the HW level, had started to emerge. As provided in *Basis of Discussion No. 14*, an island *"should be permanently above the level of high tide."*[23] During this Conference, however, no agreement was reached on this matter.

In UNCLOS, although no explicit reference is made to the term vertical datum, several implicit references can be identified. They include not only references to the *low-water line* (or *low-water mark*) and to *high tide*, but also to various other concepts the interpretation and application of which depends upon the type of vertical datum adopted by the state (e.g. as *normal baseline*, *low-tide elevations*, *drying reefs*, and *island*.[24] These concepts have indisputably an important role to play in determining the limits of maritime zones. The case of insular features may be used as a striking example. The same feature may be identified as a low-tide elevation or an island, depending upon the HW datum being used as reference. If located outside the 12-mile territorial sea limit, that difference is crucial in terms of capability to generate maritime space. Nevertheless, despite the importance of the above mentioned references, UNCLOS does not establish which tidal datum is to be used as referential for the notions of low water and high water.

Whether this amounts to an implicit recognition of the different meanings that may be given to the notions of LW and HW in state practice is the question to answer. As mentioned before, using a technical perspective there is a rationale for the existence of different vertical datums. For neither is the CD adopted in view of the definition of normal baseline, nor is the HW datum chosen considering the definition of island. One final remark has to be made. The question of choice of tidal datum is of importance only in places where the range of tide is appreciable. In coasts where no tide exists, or where the range of tide is for all purposes negligible, there are no LW and HW levels to consider. In these situations, the Mean Sea Level (MSL) is usually adopted as the sole vertical reference.

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22 24 (Supp.) *American Journal of International Law* (*AJIL*), 1930: 30.

23 *Ibid.*: 35.

24 Articles 5, 6, 7(2)(4), 9, 10(3)(4)(5), 13(1), 47(1)(4)(7) and 121(1) of UNCLOS.

4.2 The Normal Baseline

UNCLOS defines the normal baseline as *"the low-water line along the coast as marked on large scale charts officially recognized by the coastal State."* This provision does not differ from the equivalent provision in the TS Convention.[25] The *travaux préparatoires* of this Convention may thus be resorted to in order to clarify the meaning of the UNCLOS provision. The commentary of the International Law Commission (ILC) to the relevant draft article reiterates the idea, put forward during the 1930 Conference, that there are different meanings for the expression *"low-water line"*, concluding that *"there is no uniform standard by which states in practice determine this line."*[26] In the absence of any indications to the contrary, these views must be assumed as remaining valid.[27]

In practical terms, the adoption of a more extreme CD (a lower LW datum)[28] has the effect of 'pushing' the normal baseline seawards. Nonetheless, this question does not have the same importance in all areas. It is much more sensitive in locations where, simultaneously, the range of tide is significant and the incline of the coast is very gentle. For example, if a vertical difference of 1 metre existed between two chart datums (different LW levels), in a coast with a slope of 0.3°, the displacement of the LW line would be approximately 190 metres seawards. Nonetheless, these values are somewhat extreme and uncommon in reality. More likely to occur is a situation where those values are respectively 0.5 metres and 3°. Here, the displacement of the low-water line would be less than 10 metres.

In the LOS Convention, the low-water line appears as the reference line for measuring the breadth of all maritime zones,[29] namely the territorial sea, the contiguous zone, the exclusive economic zone (EEZ) and the continental shelf.[30] Consequently, the adoption of more extreme CD allows states to extend their jurisdiction further offshore. However, insofar as nautical charts have a very specific purpose – navigation – it is not likely that states resort unreasonably to this approach with the only purpose of extending their maritime spaces. More importantly, even if a more extreme CD is chosen, the limits of maritime zones will only be pushed seawards if the displacement of the LW line occurs in the areas surrounding the 'controlling basepoints'.[31] If not, the influence of the new LW line on the limits of the maritime zones will probably be 'shadowed' by the limit-lines drawn from those basepoints.

On the other hand, it should be noted that the LW datum is also fundamental for the interpretation of UNCLOS provisions related to reefs. Article 6 refers to *"islands having fringing*

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25 Article 5 of UNCLOS; Article 3 of the TS Convention

26 *International Law Commission* (*ILC*) *Yearbook*, 1956(II): 267.

27 Nordquist, 1993: 89.

28 A tidal datum is considered more extreme than another where it establishes either a lower LW level or a higher HW level.

29 Articles 3 and 4, 33(2), 57 and 76(1) of UNCLOS.

30 Where the CS extends beyond the 200 nautical miles, this line has lesser relevance. However, it is still used as the reference for computing one of the cut-off limits to the extension of the CS is defined (Article 76(5) of UNCLOS). Because in the Geneva Convention the outer limit of the CS was referred to the 200 metre isobath, this line was also considered as the zero isobath for calculating the extent of the continental shelf (O'Connell, 1989: 174).

31 The 'controlling basepoints' may be defined as the points on the baseline that determine the location of the outer limit of a certain maritime zone. It has to be emphasised that the number of 'controlling basepoints' is not the same for all maritime zones. The number decreases as the width of the maritime zone increases.

reefs" and to *"the seaward low-water line"* of reefs, whilst Article 47(1) uses the expression *"drying reefs."* The interpretation of these provisions, which in the latter case is also related to Article 47(7), will always have to refer to the CD adopted for the charts officially recognised by states.

As established by UNCLOS, the normal baseline is the low-water line (the CD) depicted on large scale charts recognised by states.[32] This requirement has to do with the accuracy with which such a line has to be defined. In fact, the difference between low-water lines based on different chart datums would not be noticed in medium or small scale charts. Even in some of the large scale charts (e.g. 1:50,000) a distance of 100 metres is barely noticeable (2 millimetres). However, some states do not actually have their coasts completely covered by large scale charts, or do not have accurate information on their charts. How the normal baseline is to be defined in these situations is a question that requires caution. Considering that, because the requirements of the LOS Convention are not met, states would not be able to claim jurisdiction over maritime areas seems an unreasonable interpretation. If for nothing else, this is because it does not reflect the *ratio legis*.[33] In these cases, the use of medium scale charts, or large scale topographic maps, in the definition of normal baselines, has perhaps to be accepted. However, if disputes arise concerning the precise location of maritime limits, and the enforcement of state jurisdiction, the limits based on such baselines may not be in some cases opposable to other states.

One final thought should always be borne in mind. Whatever the adopted tidal datum, and independent of how extreme it is, situations will most probably exist when very exceptional circumstances give rise to more extreme tidal levels. It would therefore be very difficult to define a scientifically-based tidal datum that would account for all possible circumstances. All in all, the conclusion seems to be that, as far as international law is concerned, states can opt for any chart (LW) datum, in accordance with their discretionary judgement, and considering their own particular geographical characteristics and interests. As observed before:

> *It is evident then that an international low-water plane has not been established and that there is doubt respecting the possibility of establishing it. It follows that the low-water line for purposes of delimitation of the territorial sea remains, at least for the present and foreseeable future, that adopted by each State.*[34]

4.3 Islands

As mentioned above, during the 1930 Conference the definition of island advanced by the Preparatory Committee stated that an island *"should be permanently above the level of high tide."*[35] The use of the adverb *"permanently"* seemed to require the adoption of a very extreme HW datum, and was kept in the draft articles of the ILC. However, following a proposal made during the debates in the Commission, this adverb was qualified by the expression *"in normal circumstances."* The use of this expression was proposed in order to take account of *"exceptional cases."*[36] For this reason, Article 10 of the 1956 draft articles defined an island as

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32 Some states do not produce and publish their own nautical charts. In this case, they should officially state which nautical charts are accepted as describing their coastline.

33 The reasoned essence, the spirit, of a certain legal provision.

34 O'Connell, 1989: 177, 185.

35 Para. 4.1. *supra*.

36 Lauterpacht, *ILC Yearbook*, 1954(I): 92.

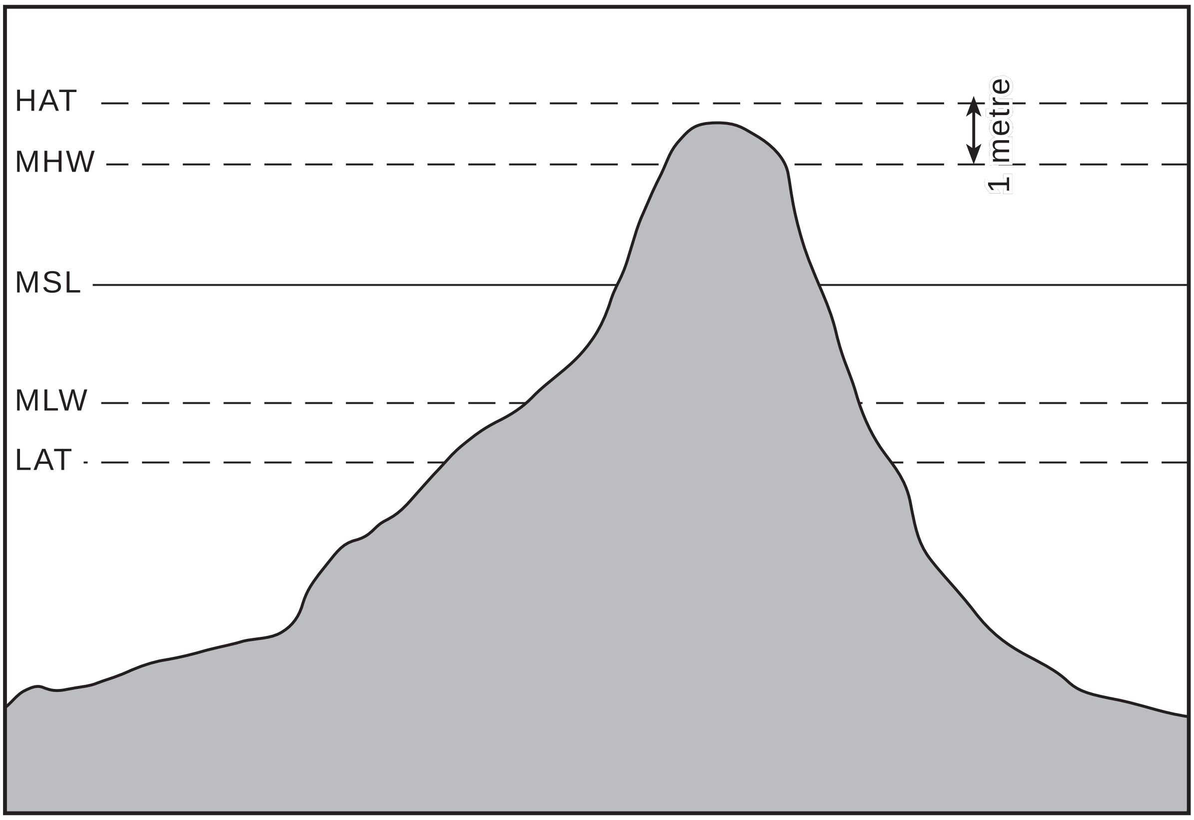

Figure 3: Insular Features and the Tidal Datum

"an area of land, surrounded by water, which in normal circumstances is permanently above high-water mark."[37]

The inclusion of the term *"normal circumstances"* raised several difficulties. In fact, the simultaneous use of the adverb *"permanently"* and the expression *"normal circumstances"* was criticised by the United States during the 1958 Geneva Conference on the grounds that they were conflicting.[38] Arguing, moreover, that there was *"no established state practice regarding the effect of subnormal or abnormal or seasonal tidal action on the status of islands"*, the United States then proposed the omission of both terms in the definition. This was eventually approved by the Conference. As a result, the definition of island incorporated in Article 10(1) of the TS Convention only requires that the land feature *"is above water at high tide."* The very same expression was transposed to Article 121(1) of UNCLOS. Undoubtedly, this look into the intention of the parties seems to indicate not only a somewhat flexible approach in this matter, but also that this was meant to reflect state practice. The HW datum to which the concept of island is referred seems to be, therefore, any reasonable datum adopted by a coastal state.

Insofar as this datum is absolutely fundamental for the distinction between an island and a low-tide elevation, such a flexible approach is very likely to lead to difficulties in certain cases. This is even more so because, contrasting with the normal baseline definition, Article 121(1) does not make any reference to nautical charts officially recognised by states. Therefore, the HW

37 *ILC Yearbook*, 1956(II): 270. The commentary to this draft provision asserted that the term *"island"* was *"understood to be any area of land surrounded by water which, except in abnormal circumstances, is permanently above high-water mark."*

38 Document A/Conf.13/C.1/L.112, Official Records (III): 242.

datum relevant for the purposes of establishing the status of island does not necessarily have to be the datum used in nautical charts.[39] For this reason, it is important to find out which HW datum have been used in actual terms by states. The conclusion appears to be that, although the HAT was proposed by the IHO for adoption in nautical charts, several states have been using other datums as HW datum in the definition of islands, such as the MHWS[40] or the MHW.[41] Furthermore, even in nautical charts, as can be seen by the examples shown in Appendix 2, not all states use HAT as the HW datum.

The full impact that the adoption of different HW datum may have in terms of maritime jurisdiction will become evident later in this analysis.[42] For now, this author will only say that its importance is due to the fact that the adoption of a lower HW datum enables states to extend their claims over sea areas. An example may perhaps clarify this assertion. One may consider a case in which the difference between the HAT and the MHW at a certain place is 1 metre. In this case, every insular feature that is covered with less than 1 metre of water when the HAT occurs, will be considered an island if the MHW is adopted as HW datum, or will qualify only as a low-tide elevation if the HAT is adopted (Figure 3).

With regard to claims over maritime zones, the attribution of island status is not immaterial. Even if located outside the 12-mile territorial sea limit, an island is always entitled to its own territorial sea (and perhaps to a contiguous zone), and in some cases to 200 miles of EEZ and continental shelf.[43] On the contrary, a low-tide elevation can only generate maritime spaces if located within the territorial sea.

4.4 Low-Tide Elevations

The concept of low-tide elevation is defined by reference not only to the LW datum, but also in negative terms to the HW datum. As mentioned above, the substantive distinction between islands and low-tide elevations can be traced back to the 1930 Hague Conference.[44] Article 13(1) of UNCLOS defines this feature as *"a naturally formed area of land which is surrounded by and above water at low tide but submerged at high tide."* This provision is a verbatim transcription of the equivalent provision in the Geneva Convention.[45]

No allusion is made therein to large scale charts officially recognised by the coastal state. Again, it is important to establish whether the chart datum may be different from the LW datum used in the definition of low-tide elevations. The answer seems to be in the negative. This is so because

[39] It must be noted that, in nautical charts, the *green area* along the coast represents the area that is covered at high tides and uncovered at low tides. However, the HW datum is not used in every chart. In charts with scales smaller than 1:15,000, the inner limit of the *green area* is normally defined by the MSL line, because the difference between the two is not noticeable. Moreover, even in charts with scales of 1:15,000 or bigger, the adoption of a HW datum only occurs when the required surveys were carried out in those areas. For this reason also, the MSL line will often be used.

[40] As the UK, New Zealand, Ireland, Micronesia, Cook Islands or Fiji (Symmons, 1995: 22; Dipla, 1984: 33).

[41] As the USA or Kuwait (Symmons, 1995: 23; Dipla, 1984: 33). The MHW is confirmed as the HW datum in some decisions of the USA municipal courts. See United States vs. California, 382 US 448 (1966), Borax Consol, Ltd. vs. Los Angeles, 296 US 10 (1935) and, more recently, United States vs. Alaska (1997).

[42] Para. 5.1. *infra*.

[43] This is what results from the concatenation of Articles 13(2), 47(1) and 121 (2) and (3).

[44] Point VI – Definition of an Island, 24 (Supp.) *AJIL*, 1930: 35.

[45] Article 11(1) of the TS Convention.

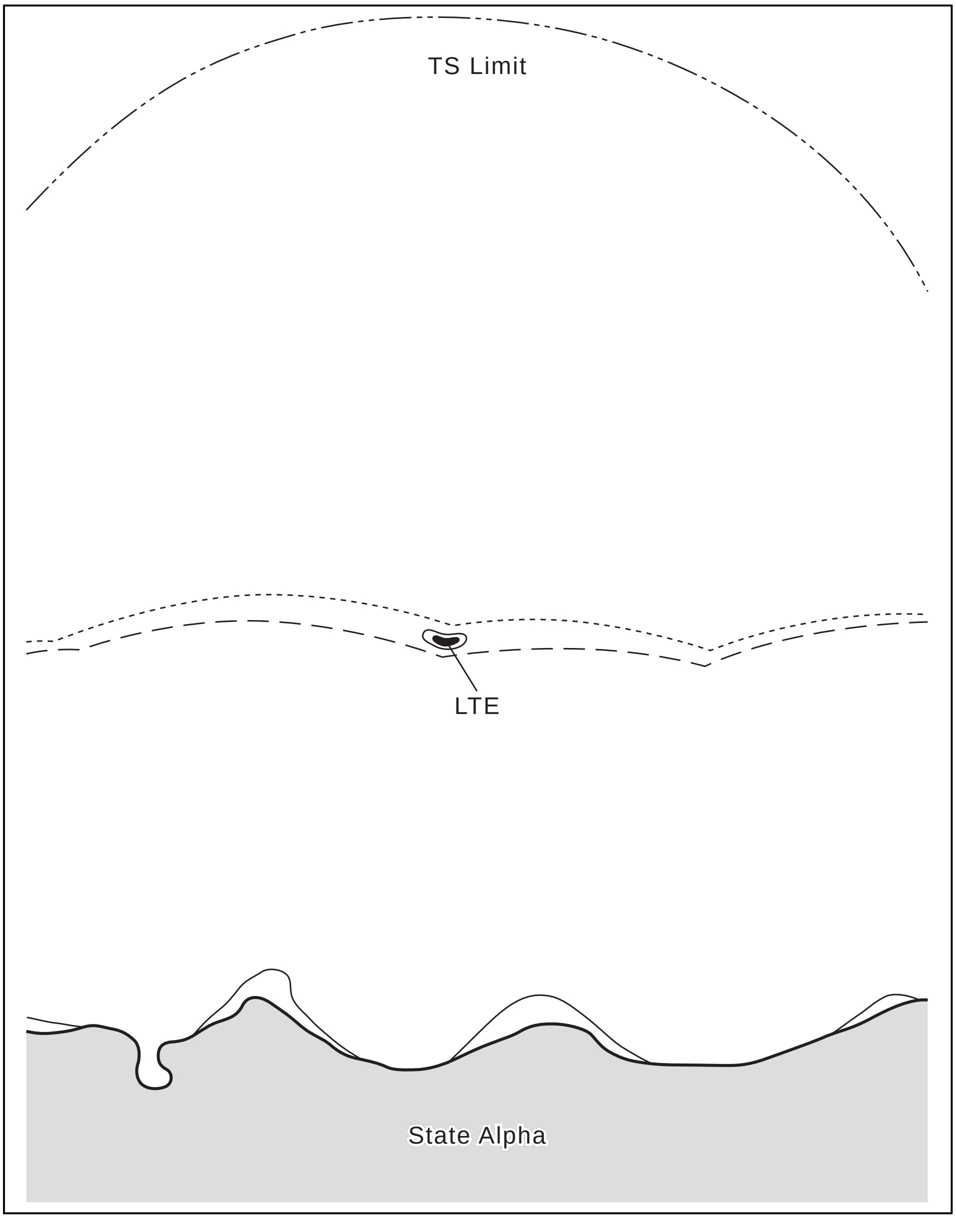

Figure 4: Territorial Sea Limits

the LW line around these features *"may be used as the baseline for measuring the breadth of the territorial sea."* This can but be seen as an implicit allusion to Article 5 of UNCLOS, which defines the normal baseline by reference to officially recognised charts. Due to the systematic element of interpretation, therefore, one has to assume that this LW datum should be the same as that indicated in Article 5. With regard to the HW datum, this author believes that it has to be seen from the same perspective as that of Article 121, which establishes the legal notion of island. In short, the choice of datum falls within the discretion of states, and the adopted datum does not necessarily have to be the same as the one used in nautical charts.

The practical effects of the choice of LW datum are analogous to those described for the normal baseline. The adoption of a lower CD may lead to the appearance of *new* low-tide elevations on charts, that would not be represented if a more lenient datum had been chosen. Actually, the LW line of these drying features can be considered as a segment of the normal baseline (for purposes of determining the outer limit of all maritime zones), provided that they are located within the 12-mile limit of the territorial sea.[46]

The choice of a more extreme LW datum, jointly with the emergence of low-tide elevations, may have an important effect in terms of maritime claims. When the limits of the TS are extended seawards, a 'leapfrogging' (or 'chain reaction') effect may give rise to a substantial increase of the maritime jurisdiction of states. This is illustrated in Figure 4. Using as reference the tidal level MLW, a fictitious state Alpha defined the LW line (normal baseline) along its coast as depicted by a thick black line. The 12-mile limit of the territorial sea, based on that normal baseline, is represented as a dashed line. If state Alpha decides, following the IHO recommendation, to change the CD of its nautical charts to LAT, a new LW line has to be computed. The thin black line represents what could potentially be the new LW line in those places where it departs from the former LW line. The new outer limit of the territorial sea would be as shown by the dotted line. However, due to the extension of the territorial sea limit, a low-tide elevation (LTE) lies now within territorial waters. The LW line of this insular feature can therefore be used *"as the baseline for measuring the breadth of the territorial sea."*[47] As a result of a 'chain reaction' effect, caused by the change of the LW datum, the territorial sea of state Alpha is almost doubled.

4.5 The Continental Shelf beyond 200 Nautical Miles

The jurisdiction of states over the continental shelf may extend beyond 200 nautical miles measured from the relevant baselines in cases where the outer limit of the continental margin, as defined in UNCLOS, lies beyond that distance.[48] But the information upon which that extension is based must be submitted to the Commission on the Limits of the Continental Shelf (CLCS), which will then make recommendations to the claiming states. The final limits of the CS established by the state have to take account of these recommendations.[49]

To provide some guidance to coastal states in respect of the understanding that will be adopted in the evaluation of the submissions for extension of the CS, the CLCS prepared a set of *Scientific and Technical Guidelines*. A provisional version of these guidelines was made available by September 1998; and the final version was published in May 1999.[50] Certain aspects concerning the "*geodetic definition of baselines*" are dealt with in this document. The Commission acknowledged expressly, first, that many definitions of the LW line are used in state practice *"to display the profile of the coastline on official nautical charts"*; and second, that these different definitions are due to specific regional tidal regimes. The conclusion of the Commission is that *"there is a uniform and extended state practice which justifies the acceptance of multiple interpretations of the low water line"*, and that all of them will be regarded *"as equally valid in a submission."*[51]

46 Articles 4, 5, 13, 33 (2), 57 and 76 (1) of UNCLOS.
47 Article 13(1) of UNCLOS.
48 Article 76 of UNCLOS.
49 Article 76(8) of UNCLOS; Articles 3, 4 and 8 of Annex II to UNCLOS.
50 United Nations Convention on the Law of the Sea, Documents CLCS/L.6 (4 September 1998) and CLCS/11 (13 May 1999).
51 Document CLCS/11, para.3.3.5.

Noteworthy is the difference between the provisional and the final versions of the Guidelines on this matter. In the provisional document, the Commission affirmed that the multiple interpretations of the LW datum would be *"regarded as equally valid in a submission,* ***with the condition that none may fall below the level of the lowest astronomical tide*** *(LAT)."*[52] This seems to mean that, at first glance, the Commission felt that it could establish a limit to the choice of datum used for defining the LW line. Undoubtedly, the Commission is entitled to cooperate with other international organisations of a technical nature, such as the IHO. But this seems to fall way short of meaning that the Commission is legally empowered to turn an IHO recommendation as regards the use of LAT as the LW datum into a binding restriction. Because many states have been using empirical LW datums that may actually fall below LAT, as for instance the LLW and some *ad hoc* datums, such restriction could only be imposed upon states if founded on international law. But there seems to be several arguments that support the opposite view.

First, the literal element of Article 5 of UNCLOS and the *travaux préparatoires* indicate that states have ample freedom to decide what vertical datum to use in their nautical charts. This idea is clearly implied in the commentary of the ILC to the 1956 draft Article 4 when stating that such freedom was "*hardly likely to induce governments to shift the low-water lines on their charts unreasonably.*"[53] Indeed, inasmuch as the main concern of nautical charts is the safety of navigation (which includes providing ships with datums that allows them to enter harbours safely), one should not expect unreasonable changes in the datum of official charts stemming solely from expansionist intentions.

Secondly, the CLCS seems to be empowered only to proceed to 'technical homologation' of the claims put forward by states. Even if a state changed the CD of its official cartography to obtain advantages in terms of the location of baselines, it is doubtful that the Commission could juridically scrutinise such an act. The references that are made in Article 76 of UNCLOS to "*the baselines from which the breadth of the territorial sea is measured*" have to be seen in the light of the legal interpretation of the relevant provisions. Apparently, nothing in Article 5 confines the scope of decision of states on this matter. The adoption of LAT as a legally binding level for purposes of the submissions presented to the Commission would have amounted, consequently, to the imposition of a more stringent requirement than that determined by UNCLOS as regards the definition of the normal baseline.

Finally, the requirement of using the LAT as LW datum could have led to difficulties of a legal and practical nature. Assuming that a state has been using a LW datum lower than LAT in its nautical charts, this would mean that the normal baseline defined in its officially recognised charts (to which Article 5 makes reference) would be unusable for purposes of claiming an extension of the continental shelf. This would also mean that to submit its claim, the state would be forced to re-define the relevant points of its normal baseline. On the other hand, to define the normal baseline by reference to LAT, accurate tidal data from preferably 19 years would have to be gathered. It is well known that many states around the world do not have such data. Others do not have the data regarding certain segments or precise locations of the coast.[54] And obtaining this type of data could in some cases take a long time. Insofar as states

52 Document CLCS/L.6, para.3.3., p.24, emphasis added.

53 *ILC Yearbook*, 1956(II): 267. See the example given in para.4.2. *supra*, where it is shown that in most situations the displacement of the LW line due to an alteration of the CD is of only few metres.

54 Even to states with advanced technology, as the United States of America, this issue may pose certain difficulties. During the US vs. Alaska case, although concerning the computation of the MHW, the

have only 10 years to present their submission to extend their continental shelves to the CLCS,[55] this would have created further difficulties to states.

Taking into account of all these arguments, one can but support the view followed by the Commission in the final guidelines, when accepting as equally valid all multiple interpretations of the low water line. Importantly, this preparatory work of the Guidelines reinforces the idea that when it comes to the LW line states have almost an absolute freedom of choice.

5. Maritime Boundary Delimitation

5.1 The Impact of the Tidal Datum

The goal of this study is also to shed some light on the importance of tidal datums in maritime boundary delimitation. As mentioned above, the choice of LW datum may be relevant in the definition of the normal baseline. Consequently, in cases where a maritime boundary is to be defined on the basis of an equidistance (median) line, that choice may also impact on the boundary line. This is because the equidistance line is usually measured from the nearest points on the baselines of the two states.

Where the normal baseline is 'pushed' seawards through the use of a lower CD, the course of the equidistant boundary line will be consequently altered. The state using a lower CD will then have its maritime jurisdiction expanded. Let us consider an equidistance boundary, the course of which is 'controlled' on either side by two imaginary isolated points situated 20 miles apart. Having recourse to the example presented above, let us also assume that one of the states adopts a new CD that is 0.5 metres below the previous one, and that the bottom gradient near its LW line is 3°. The LW line of the 'controlling basepoint' would be displaced 10 metres seawards, and would result in a displacement of the equidistance line of 5 metres in the direction of the other state. This may be deemed a minimal effect.

When a 'chain reaction' effect occurs, however, the impact on the boundary line may be much greater. The appearance of *new* low-tide elevations at a distance of less than 12 miles from the coast of one of the states may alter considerably the course of the equidistance line. The situation may be even more dramatic if it involves the appearance of insular features that may be attributed the status of island. Although the effect is in many cases confined to the vicinity of the area where new features appear, there may be cases where a newly emerged 'controlling basepoint' determines the course of most or the whole of the boundary. The equidistance line may then be dramatically shifted towards the other state's coastline. In Figure 5, points "A" and "B" are approximately 55 miles apart and were initially the 'controlling basepoints' of the boundary to the east. Due to the adoption of a new CD, an LTE emerged in point "B1" at a distance of approximately 11.5 miles from the coast of state Bravo. The course of the equidistance boundary, which is now 'controlled' by "B1", is represented by the dashed line.

non-existence of long-term data determined the need to carry out some estimations on the basis of an adjustment of data from other tide stations. See the analysis on the error band, Report of the Special Master: 266-269.

55 Article 4 of Annex II to UNCLOS.

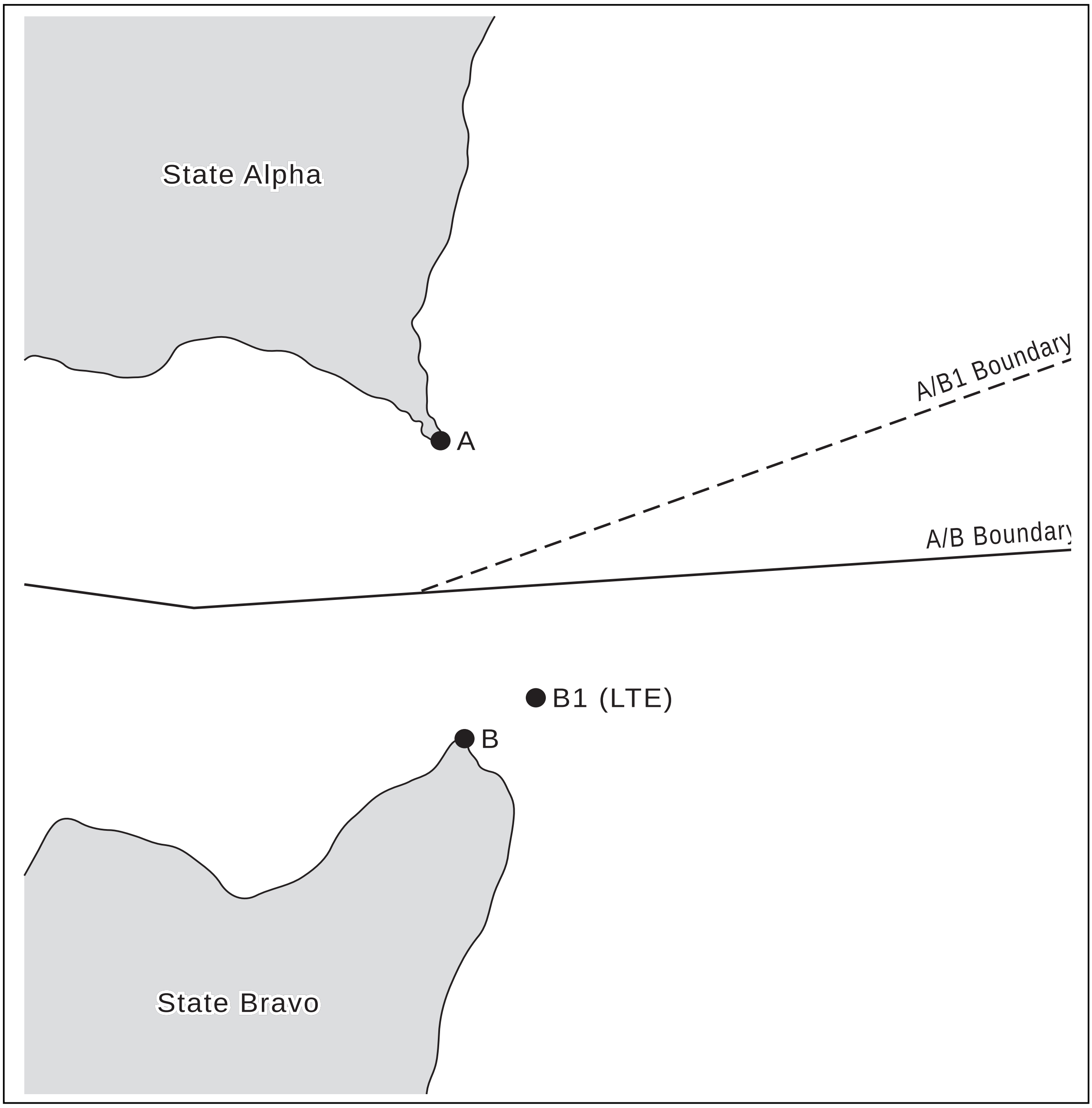

Figure 5: The Potential Impact of the Tidal Datum on an Equidistant Boundary

The adoption of a lower HW datum, relevant for purposes of the attribution of island status to land features, has a qualitatively similar effect as far as the computation of equidistance lines is concerned. If a new island appears in the proximity of the boundary line, it will lead to a shift of the equidistance line away from the coast of the state in which title over the island is vested. However, some differences have to be acknowledged. Most importantly, in contrast to what happens with low-tide elevations, islands located outside the territorial sea also have to be accounted for. Moreover, disregarding the effect of an island over the equidistant line is perhaps more difficult than disregarding the effects of low-tide elevations, if only because islands are always entitled to a belt of territorial sea.[56]

[56] A different problem is to decide how to weigh the effect of such a small island in the delimitation.

It must also be pointed out that particular attention must be drawn to territorial sea delimitations.[57] Firstly, the equidistance line is, in these cases, explicitly favoured as the starting line for the delimitation.[58] Secondly, the use of low-tide elevations as relevant basepoints for continental shelf and EEZ delimitation is not easily accepted by all states.[59] Thirdly, if it is assumed that the feature in question is so small that its qualification as an island depends on the HW datum that is chosen, it is almost certain that it will fall within the notion of *"rock"* established by Article 121(3) of UNCLOS. Accordingly, it will not be entitled to an EEZ and continental shelf.[60]

Finally, it is probably worthwhile underlining that the historical data concerning each insular feature and its representation on nautical charts have to be taken into account in the delimitation. A feature that does not show a consistent status through time, either as a low-tide elevation or as an island, will very likely tend to be given less weight in a delimitation.

5.2 Agreements between States

Without question, the debate on tidal datums in maritime delimitation becomes irrelevant if the states involved in the delimitation use the same LW and HW references in their charts and national legislation, or if they agree to accept each other's datums. Problems are likely to arise when different tidal datums are adopted and states do not agree thereto. In this context, different viewpoints will emerge respecting the possible depiction of baselines, low-tide elevations and islands. Notably, the computed equidistance line will necessarily not be the same. Two cases of state practice may illustrate the way in which these issues may be dealt with.

In the Anglo-Belgian Agreement concerning the delimitation of the continental shelf,[61] three low-tide elevations were considered as basepoints for purposes of determining the boundary line: *Trapegeer*, off the Belgian coast, and *Long Sand Head* and *Shipwash Sand*, off the coast of the UK.[62] In the end, *Shipwash Sand* was not taken into account because a hydrographic survey of 1990 showed that it could no longer be considered as a low-tide elevation.[63] However, surveys carried out between 1995 and 1997 show that feature again as a low-tide elevation.[64] If another CD, different than LAT (lower or higher), had been used, this feature could either not have been considered at all (in the case of a higher CD), or not have been disregarded as it was (in the case of a lower CD). The approach adopted in the delimitation was a pragmatic one, *"designed to achieve an equitable solution."* After having agreed on which basepoints to use, an area of

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57 In terms of delimitation of the contiguous zone, since UNCLOS does not have a specific provision, it all comes down to the interpretation of the conventional regime. Without discussing the issue in depth, we may say that the application of Article 15 by analogy is perhaps the best solution.

58 Article 15 of UNCLOS. The question as to whether equidistance should also be used as the starting point of EEZ and continental shelf delimitations is part of an on-going debate. Its discussion is clearly outside the scope of this text. Without once again entering into details, this author's view is that international law requires equidistance to be used as the first approach to any delimitation.

59 During the negotiations of the Belgian-French delimitation agreement concerning the CS, *"Belgium took the view...that low-tide elevations should not be taken into account"* (Anderson, 1993a: 1,893).

60 Therefore, it will not influence the delimitation of these maritime zones.

61 Anderson, 1993b: 1,901-1,912.

62 Drawing 1 of Appendix 3 – from Admiralty Chart No.1406.

63 Anderson, 1993b: 1,906.

64 See Drawing 2 of Appendix 3 – from the 1997 edition of Admiralty Chart No.2052. Shipwash Sands appears as a 0.1 metre low-tide elevation. Carleton, 1999: para. 6.54.

overlapping claims defined by equidistance lines based on different basepoints was *"accurately calculated."* This area was then divided giving *Long Sand Head* approximately one-third effect.[65]

Three insular features had to be accounted for in the French-Belgian Agreements concerning the delimitation of the territorial sea and the continental shelf:[66] *Trapegeer*, off the Belgian coast, and *Banc Small* and *Banc Breedt*, off the French coast. Whereas according to Belgian charts (which used MLWS as CD) *Banc Breedt* was not a low-tide elevation, in the French charts (which used LAT as CD), it could be qualified as such. However, as shown in Drawings 3 to 7 of Appendix 3, it is currently possible to realise that not only this feature, but also *Trapegeer*, has a variable status.[67] At the time, as a compromise in order to achieve an equitable solution, both states agreed to a continental shelf boundary line giving a one-fifth effect to *Banc Breedt* (considering 0.1m of height) and a four-fifths effect to *Trapegeer* (considering 0.4m of height).[68] In terms of the territorial sea boundary, the final line results from the division into two equal parts of the area claimed by the two states based on dividing lines that considered different chart datums.[69] The agreed boundary lines and the lines giving no-effect and full-effect to *Banc Breedt* are shown in Drawing 5 of Appendix 3.[70]

In general terms, if insoluble divergences concerning the CD used arise, the three following possibilities may be considered to overcome the situation. One possible solution is that states accept the different assessments based on different data, and agree to the relative weight that is to be given to each basepoint or feature when computing the equidistance line. This solution has no extra costs, but the states should expect a long time to be spent on the negotiations to agree on how the line will weigh the different features.

A second idea is to completely disregard the assessments made by either state, and to try to reach a pragmatic solution, independently of geographical considerations and acceptable to both states. As the former, this way has no extra costs but the time needed to sort out a creative and compromising solution may also be significant.

Another possibility is that the states involved in the delimitation agree to a common tidal datum,[71] and effect the delimitation on the basis of a common geographical scenario. The adopted CD may be either one of the two that are used by the states, or another one different from

65 Carleton, 1999: paras. 6-54, 6-55; Anderson, 1993b: 1,905.

66 Anderson, 1993a: 1,891-1,900.

67 Drawings 3 to 7 of Appendix 3 – respectively from: the 1989 edition of Admiralty Chart No.1350 (showing Banc Breedt as a low-tide elevation emerging 0.1 metre above CD); the 1994 edition of Admiralty Chart No.2449 (showing Trapegeer as a low-tide elevation, without indication of its height above CD due to the scale of the chart); the 1997 edition of Admiralty Chart No.1872 (showing the highest points of Banc Breedt and Trapegeer as being 0.2 and 0.3 metres below CD respectively); the 1992 edition of Netherlands Chart No.1348 (showing the highest points of Banc Breedt as being 0.1 metres above CD and Trapegeer as being at CD level); the 1997 edition of Belgium Chart No.102 (showing the highest points of Banc Breedt and Trapegeer as being 0.2 and 0.3 metres below CD respectively). The charts from which these figures were derived present different hydrographic information as a result of the different data available at the time of their compilation.

68 Anderson, 1993a: 1,893; Article 2 of the Agreement (p.1,900).

69 Article 2 of the Agreement (*Ibid*.: 1,898).

70 The lines based on *Banc Breedt* and *Trapegeer* are only a very rough drawing. None of these features are represented on the chart from which this figure was derived, and their position was taken from charts of a smaller scale.

71 Beazley, 1993: 247; Kapoor and Kerr, 1986: 18; Bowett, 1979: 184.

both used datums. The main advantage is that the geo-legal evaluation of the boundary undertaken by each of the states will be based on a common datum. This facilitates and clears the discussion. However, new land and hydrographic surveys may be needed, which implies further and (almost always) significant costs.

5.3 Jurisprudence

Tidal datum issues have not been examined substantively by international courts. As far as is known, in the sole case in which an international court was faced with questions related to the HW datum and the definition of island, the issue was side-stepped. During the Anglo-French Arbitration, the status of *Eddystone Rock* (one of the basepoints used by the United Kingdom to compute the equidistance line in the Channel) was challenged by France. According to the datum used in British charts and legislation – the MHWS – Eddystone Rock was an island. The United Kingdom contended that the MHWS was *"the criterion for determining whether a geographical feature [had] the status of an island or low-tide elevation"*, and for establishing *"the relevant high water line."* Allegedly, the MHWS appeared in the *"practice of many other states."*[72] On the contrary, making use of a more extreme tidal reference – the HHW – France argued that *Eddystone Rock* should be regarded as a low-tide elevation, because it did not *"remain uncovered continuously throughout the year."*[73]

Perhaps somewhat hastily, the Arbitral Court brushed aside the problem of the legal status of *Eddystone Rock*, as well as the legal examination of the validity of certain HW datums. Having concluded that the French authorities had previously acquiesced to treat it *"as relevant to the delimitation of the median line in the Channel"* as regards the fisheries limits,[74] the Court was of the view that France was debarred from rejecting its use by the United Kingdom. The decision to accept *Eddystone Rock* as basepoint was thus made on the basis of an estoppel.[75] Nonetheless, since both parties had presented legal arguments regarding the HW datum to be used, the Court could have addressed this issue before presenting its conclusions. As it was, the question as to which HW datums are valid under international law remained unanswered.

The uncertainties concerning this issue have also been reflected in decisions of municipal courts. In the recent United States of America vs. Alaska case (hereinafter US vs. Alaska), the question of HW datum was again raised.[76] Insofar as the parameters established by international law as regards baselines have been applied in the USA for purposes of determining each state's ownership rights under the *Submerged Lands Act*, this decision may shed some light on this subject.[77] The problem here was that *Dinkum Sands*, an insular feature located beyond the 3-mile limit measured from the nearest islands or mainland, would only entitle Alaska to rights over submerged lands if it would meet the requirements established in Article 10(1) of the Geneva Convention.

72 Arbitral Decision, paras. 126 and 127.
73 *Ibid*., para. 125.
74 *Ibid*., paras. 143 and 144.
75 Antunes, 2000: 22-23.
76 For a in-depth analysis of the problem concerning the HW datum in this case, see Symmons, 1999.
77 Symmons, 1999: 1-2; Bederman, 1998: 82, 86. Although these references concern the TS Convention, they may be used in relation to UNCLOS provisions which, in this matter, have exactly the same content.

One important point that had to be settled concerned the interpretation of the expression *"above water at high tide."* Resorting to the *travaux préparatoires*, the US argued that the adverb *"permanently"* was still implicit in this provision. As noted by Symmons, insofar as the deletion of this term was proposed by this state during the 1958 Conference, the situation was to say the least ironic.[78] However, in the opinion of the Special Master it was doubtful *"that the pre-Convention materials lead to such a clear-cut result."* In his view, the deletion of the expressions *"permanently"* and *"in normal circumstances"* had to be read together. This led him to conclude that the *"above water at high tide"* requirement would be met if a land feature would be *"generally"*, *"normally"*, *"usually"* above high tide which, in the case of the United States, meant above MHW.[79]

In its judgement, the Supreme Court found *"no error in the Master's conclusion."* Symmons considers that the *"automatic assumption"* by the Supreme Court *"that the mean high tide test is an acceptable international rule"* is *"entirely unjustified."* To this view, the term *"permanently"* is still implicit in the above high tide requirement, with a proviso for exceptional cases. Allegedly, it means that a more stringent datum – the LAT – should be adopted, if only for the fact that very few states use MHW in their internal legislation.[80] Accordingly, therefore, only hurricanes, tidal waves (*tsunami*), and situations where atmospheric and/or weather and high tidal factors converge may be seen as exceptional situations.[81]

Intertwined in this debate are legal and technical issues. On the one hand, there is the question of determining whether the term *"above"* means *"permanently above except in exceptional cases"*, or *"generally above."* In principle, this question would have to be answered in accordance with the rules of interpretation of treaties. However, one ought to ask first if the two interpretations are as antithetical as it was proposed. Insofar as for a land feature to be *"generally above"* high tide, it has to be above high tide most of the time, one may argue that both convey the same meaning. We have to say, therefore, that the debate concerning the interpretation of the term *"above"* is somewhat spurious.

Furthermore, even if the term *"permanently"* is deemed to be the correct interpretation, the problems still remain unresolved. This is because the other issue in this regard concerns the interpretation of the term *"high tide"*, which is essentially a technical question. Clearly, the use of different tidal datums alters significantly the definition of island. A land feature may be, for example, *permanently above mean high water*, or *permanently above the mean high water springs*, or *permanently above the highest astronomical tide*. These are (in many cases) very different standards. And it is doubtful, to say the least, that any of them acquired a binding nature under international law. In conventional law, there seems to be no evidence to support that. As far as customary law is concerned, the non-existence of a settled, extensive and virtually uniform state practice hinders the emergence of a rule.

The Supreme Court was of the view that *"the problem of abnormal and seasonal activity that the 1954 amendment addressed is fully solved by the United States' practice of constructing 'high tide' to mean 'mean high water'."*[82] It stated, moreover, that *"averaging high waters over a 19 year period accounts for periodic variations attributable to astronomic forces"*, and that

78 Symmons, 1999: 21. See para. 4.3. *supra*.
79 Report of the Special Master: 300-302.
80 Symmons, 1999: 17-19. This author was expert for the United States in the US vs. Alaska case.
81 Report of the Special Master: 297, fn.56.
82 This is a reference to the proposal put forward by Lauterpacht. See para. 4.3. *supra*, fn.39.

"non-periodic, meteorological variations can be assumed to balance out over this length of time." With all respect for other views, one must say that this approach is perfectly acceptable under international law. For as regards the meaning of *"high tide"*, no rule contradicting this reasoning seems to have emerged from state practice or to have been agreed upon conventionally.

Having recourse to the systematic element of interpretation, which requires that the Convention is interpreted as a logical and coherent legal instrument, the conclusion that the criterion *"above water at high tide"* does not mean 'above water at all times' seems inescapable. This is apparently so because in Articles 7(4) and 47(4) the Convention resorts to the expression *"permanently above sea level"* to qualify the lighthouses and similar installations that make possible drawing straight or archipelagic baselines to and from low-tide elevations. In respect of this expression, the United Nations has affirmed already that it implies that *"any such features should be clearly visible **at all states of the tides**."*[83] If the same meaning had been intended to the criterion of Article 121(1), then the Convention would have resorted to the same expression. This reinforces the suggestion that the expression *"above water at high tide"* can only be interpreted by reference to the HW datum, the choice of which lies in the margin of discretion conferred upon states.

6. Conclusions

The present study seems to indicate that there are only a few international legal rules governing the use of the tidal datum. States have, therefore, a large discretionary power when adopting any tidal datum. In principle, the main criteria applicable to the selection of tidal datums will be the precise geographical setting, and the interests and needs of states. In the absence of mandatory rules of law, the sovereignty of states prevail in this issue. Thus, any constraints on the exercise of sovereign state powers in this matter should only be accepted when clearly proven.

In what is arguably also a customary rule, UNCLOS establishes that the LW datum to be adopted in the definition of the normal baseline is the CD used in nautical charts officially recognised by states. What datum to use in nautical charts is an issue that seems to fall within the sphere of discretionary powers of the state. Technically, international law does not impose any limits upon states. The resolutions of the IHO are no more than recommendations that envisage primarily the safety of navigation and the standardisation of information. As regards submissions for extension of the continental shelf beyond 200 nautical miles, one believes that the Commission was quite correct in omitting the reference made in the provisional guidelines to LAT as the limiting standard for establishing the normal baseline.

In the case of the HW datum, international law makes no reference to nautical charts. Apparently, this means that the HW datum adopted by states in their nautical charts does not necessarily have to be the same as the one adopted in the definition of island. As to the requirement *"above water at high tide"*, one believes that it should be interpreted as meaning that in order to be an island a land feature has to be most of the time above the water level corresponding to the HW datum adopted by the state concerned. This HW datum may be, in this author's view, any level that is scientifically accepted as conveying the meaning *"high tide."*

83 UN/Baselines, p.24, para.52, emphasis added.

One key idea will hopefully emerge from this study: in certain cases, the tidal datum may have a very practical importance in the definition of maritime limits and boundaries. Primarily, vertical references are relevant in terms of entitlement to maritime areas. Their role in boundary delimitation may also be crucial in the cases in which the course of the line is to be based on equidistance. This issue will obviously have greater significance in locations where a large tidal range and a gentle incline of the bottom exist, as well as in the presence of shallow waters, shoals and sandbanks. In the case of boundaries negotiated between the states concerned, the problems related to tidal datums will be no more than another issue to address. In adjudication, however, if called upon deciding these issues courts will have to determine which, if any, are the binding standards in international law; or whether there was any explicit or implicit agreement between the states involved as to the use of a certain datum or basepoint. The agreement signed between the US and Canada leading to the Gulf of Maine case established, for instance, that *"not withstanding the fact that the parties utilize different vertical datums in the Gulf of Maine, the two datums shall be deemed to be common."*[84]

As a final note, two other issues may be briefly mentioned. One concerns the exactitude with which the normal baseline of states is defined; and the second regards the question of the rise of the mean sea level. It is important to note that the question of the tidal datum is only one aspect of the definition of the normal baseline of states. Two other aspects may be at least as important as this, namely the exactitude of the low-water line positioning survey (involving *inter alia* the problem of chart datum transfer techniques), and the positioning precision allowed by the scale of the chart in which the low-water line is depicted. On the other hand, it has to be noted that the impact of the rise of the mean sea level on normal baselines and, consequently, on the limits of maritime claims of states, has already been studied.[85] Although the question of tidal datums interrelates with this issue, it brings no change to the conclusions already arrived at. Basically, the proposed solutions seek to find a way of avoiding the retreat of states from previous claims founded on the LW datum (normal baseline). As regards maritime delimitation, this option seems to have been confirmed by the *"here-and-now approach"* adopted in the US vs. Alaska case in relation to the HW datum debate.[86] Common to both these ideas is the fact that, at a certain moment in time, they *anchor* the limits of maritime zones to geographical coordinates. The future will show if this perspective will be supported in international law.

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84 *ICJ Reports*, 1984: p.254.

85 Khadem, 1998; Prescott and Bird, 1990.

86 Symmons, 1999: 25-26.

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Appendix 1

Tidal levels

The following definitions are gathered mainly from and based on the Hydrographic Dictionary, the Admiralty Tide Tables, Perkins 1996, Hicks 1993, and O'Connell 1982. These tidal levels may be considered as the levels most commonly used as tidal datums.

LLW Lowest Low Water (**HHW** - Highest High Water): It is an arbitrary level usually defined by reference to the lowest (highest) tide observed at a certain place (independently of the factors that determined its occurrence). This datum has an empirical character, and its precise value may be somewhat lower (higher) than the observed tide.

LAT Lowest Astronomical Tide (**HAT** - Highest Astronomical Tide): The lowest (highest) level of water that can be predicted to be found under any combination of astronomical factors, considering average meteorological conditions. Lower (higher) tides should be expected to occur from time to time (especially under extreme meteorological conditions), but it may also be the case that these levels are not reached every year.

MLLWS Mean Lower Low Water Springs (**MHHWS** - Mean Higher High Water Springs): The average height of the lower low (higher high) waters during spring tides. These values vary every year, cyclically in approximately a 18.6-year period, and must therefore be adjusted to an average value for the whole cycle.

MLWS Mean Low Water Springs (**MHWS** - Mean High Water Springs): A one year average of the heights of two successive low (high) waters during spring tides. These values vary for every year, cyclically in approximately a 18.6-year period, and must therefore be adjusted to an average value for the whole cycle.

MHLW Mean Higher Low Water (**MHHW** - Mean Higher High Water): The average height of the higher low (high) water of the two daily low (high) waters over a 18.6-year period.

MLW Mean Low Water (**MHW** - Mean High Water): The average height of all low (high) waters over a 18.6-year period.

MLLW Mean Lower Low Water (**MLHW** - Mean Lower High Water): The average height of the lower low (high) water of the two daily low (high) waters over a 18.6-year period.

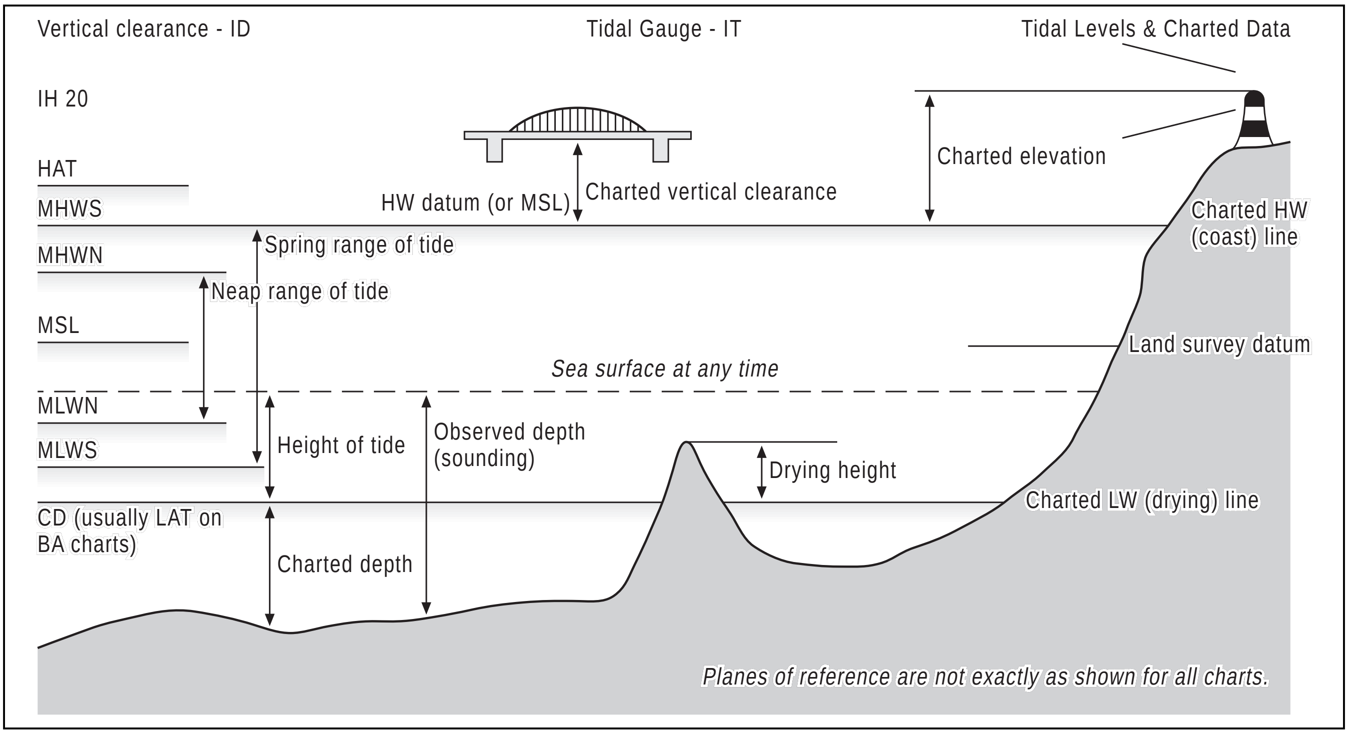
MLWN Mean Low Water Neaps (**MHWN** - Mean High Water Neaps): A one year average of the heights of the two successive low (high) waters during the neap tides. These values vary every year, cyclically in about 18.6 years, and must therefore be adjusted to an average value for the whole cycle.

MSL Mean Sea Level: The average height of the surface of the sea, at a certain place, for all stages of the tide, taking into account the (usually hourly) readings over a period of about 18.6 years. It may be seen as the average level of the water surface that would exist in the absence of tides (or in places where the tidal range is negligible).

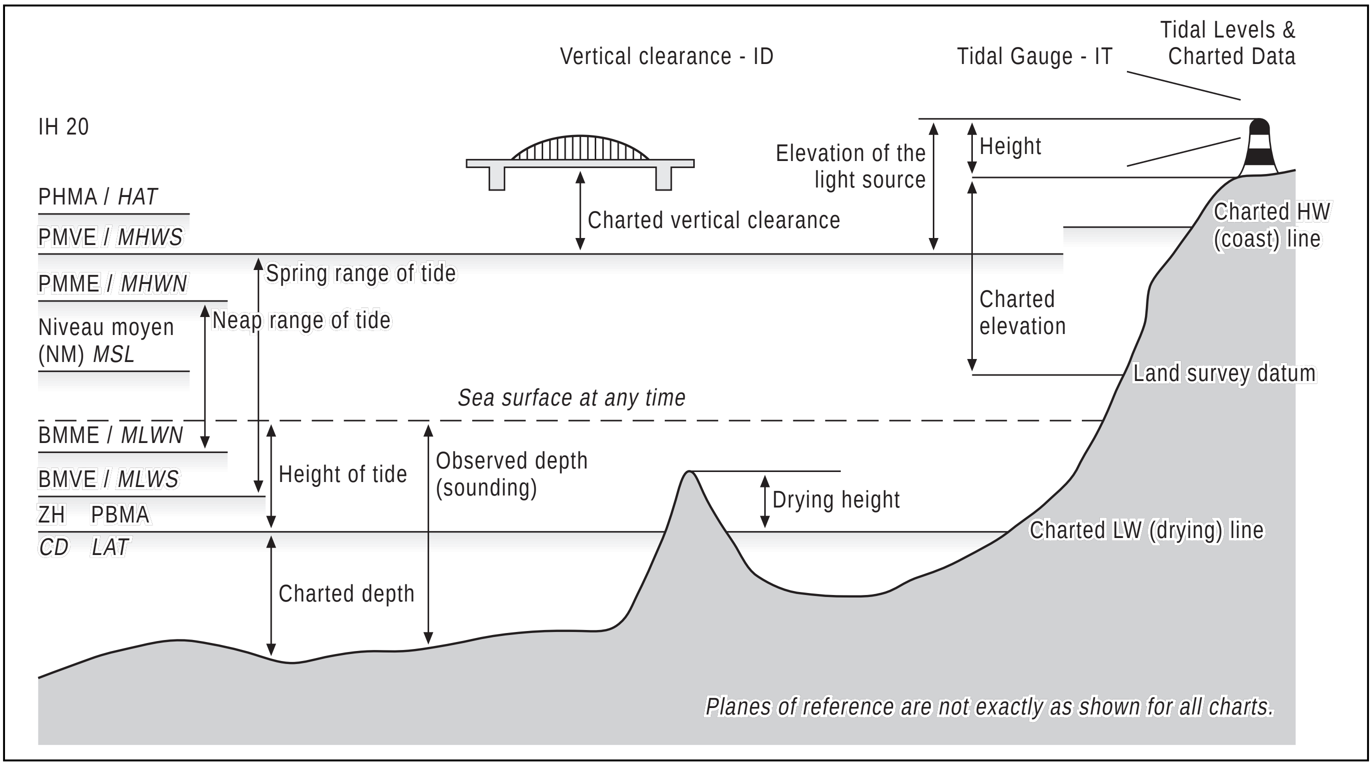
Appendix 2

Chart Datum in Nautical Charts
(The symbol IH 20 in INT 1 Charts – Information referred to 1997)

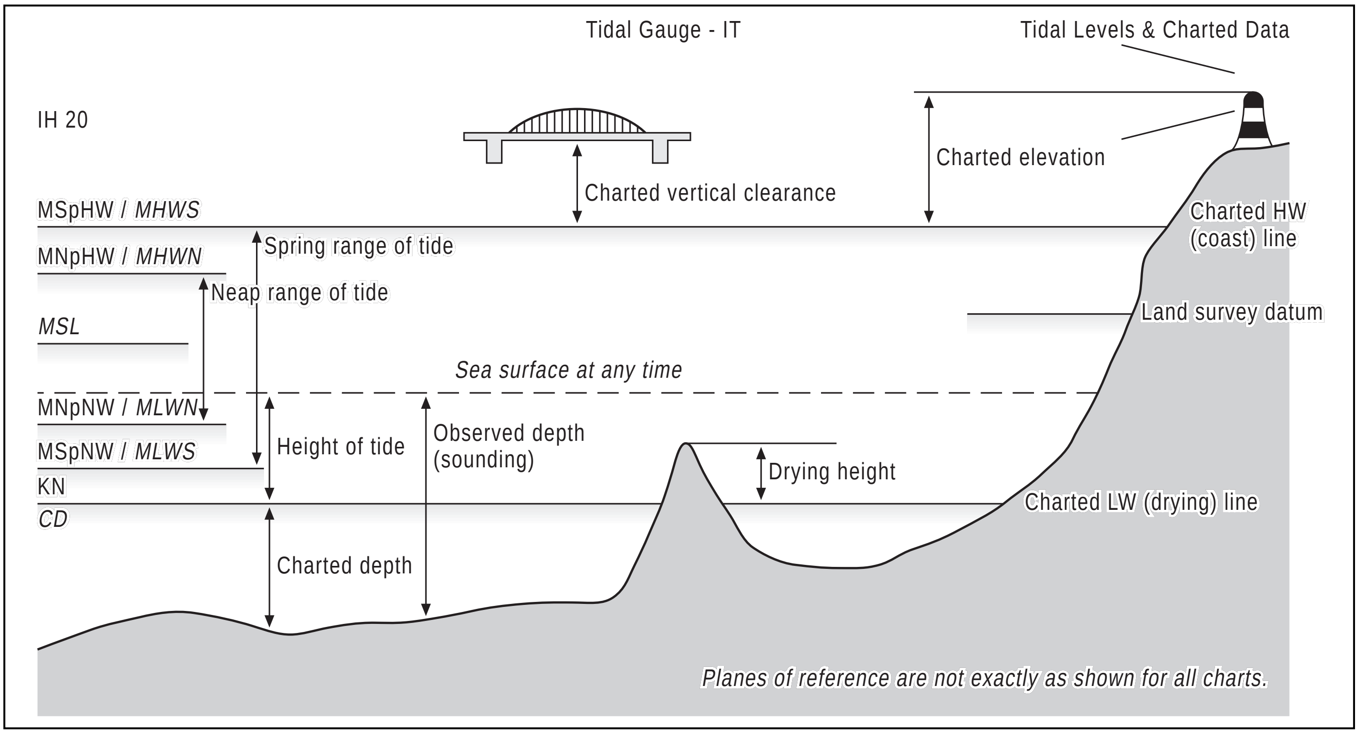
British Charts



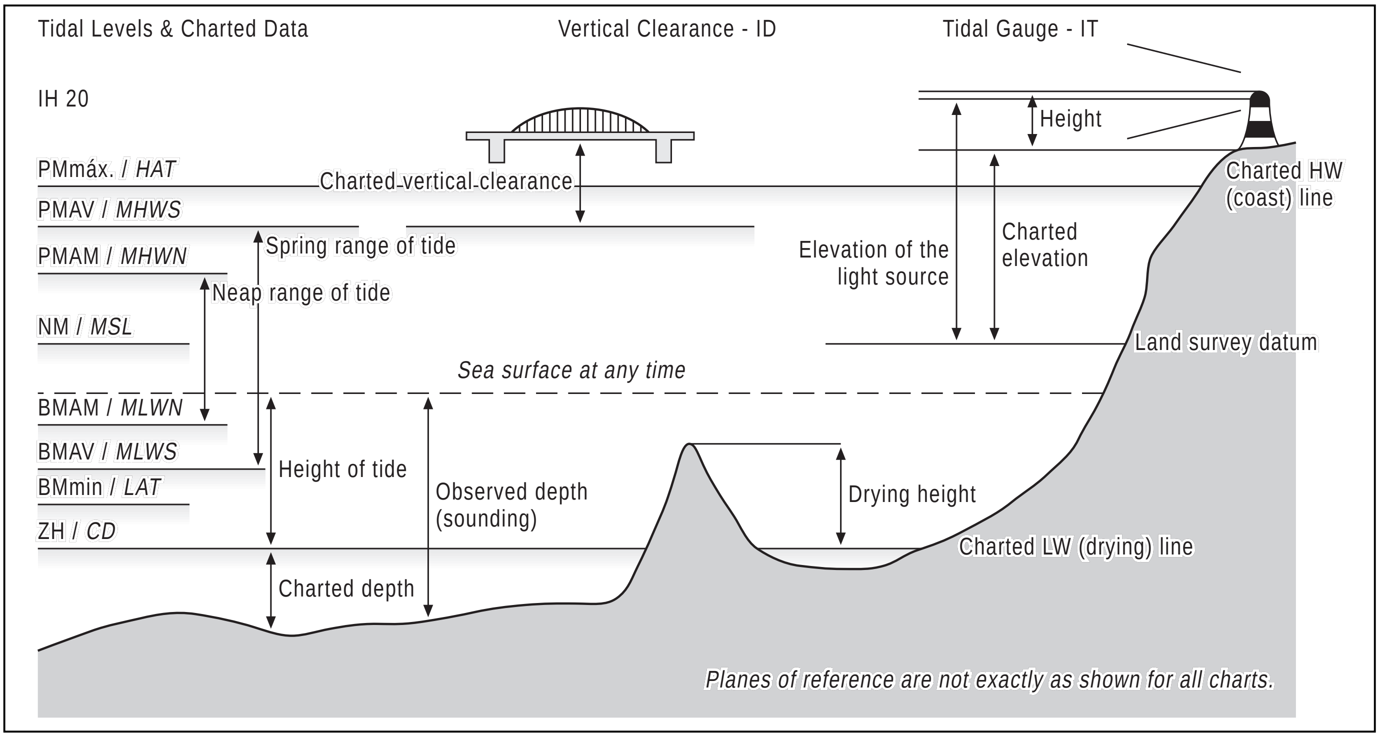
French Charts



German Charts

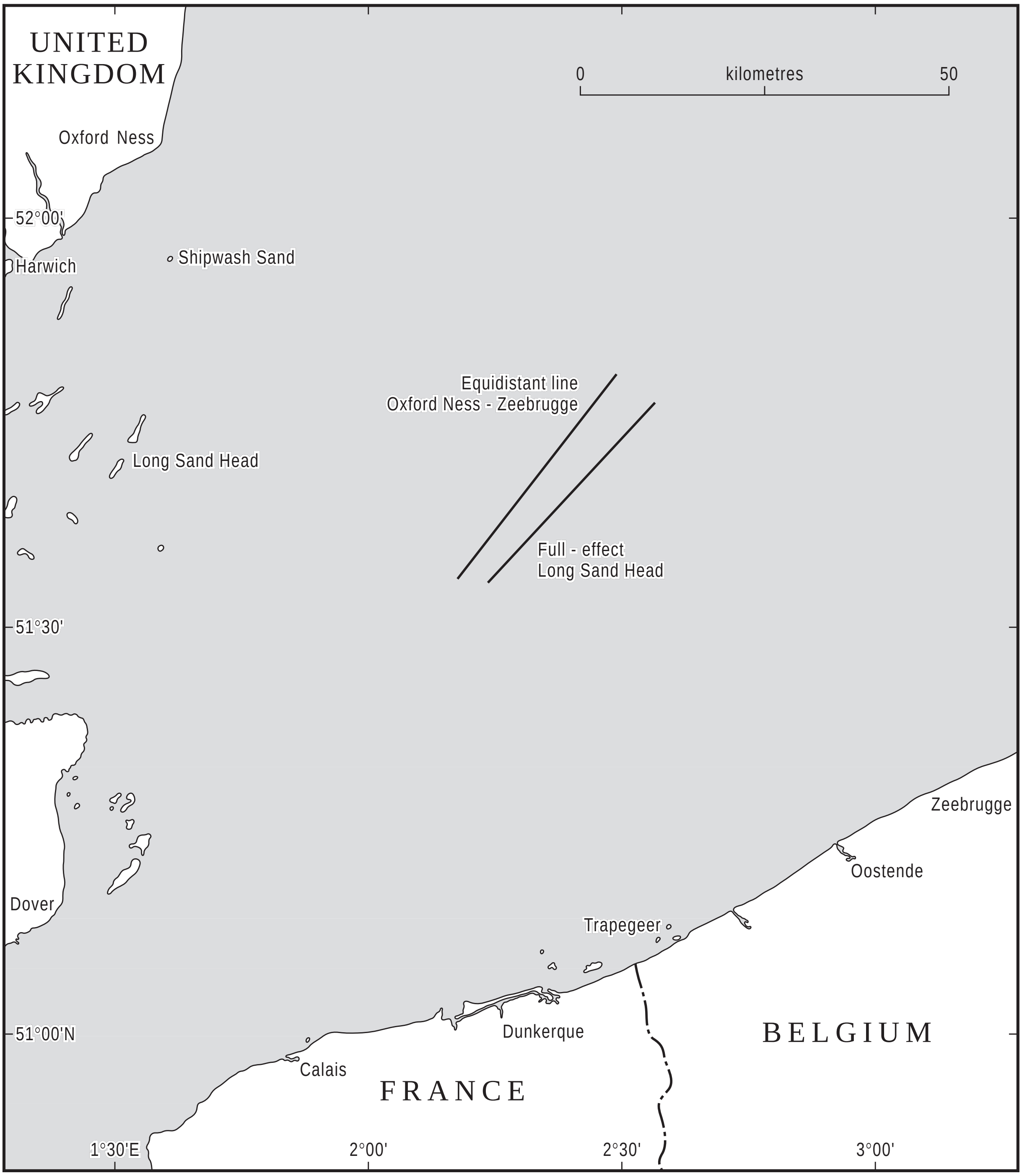


Portuguese Charts

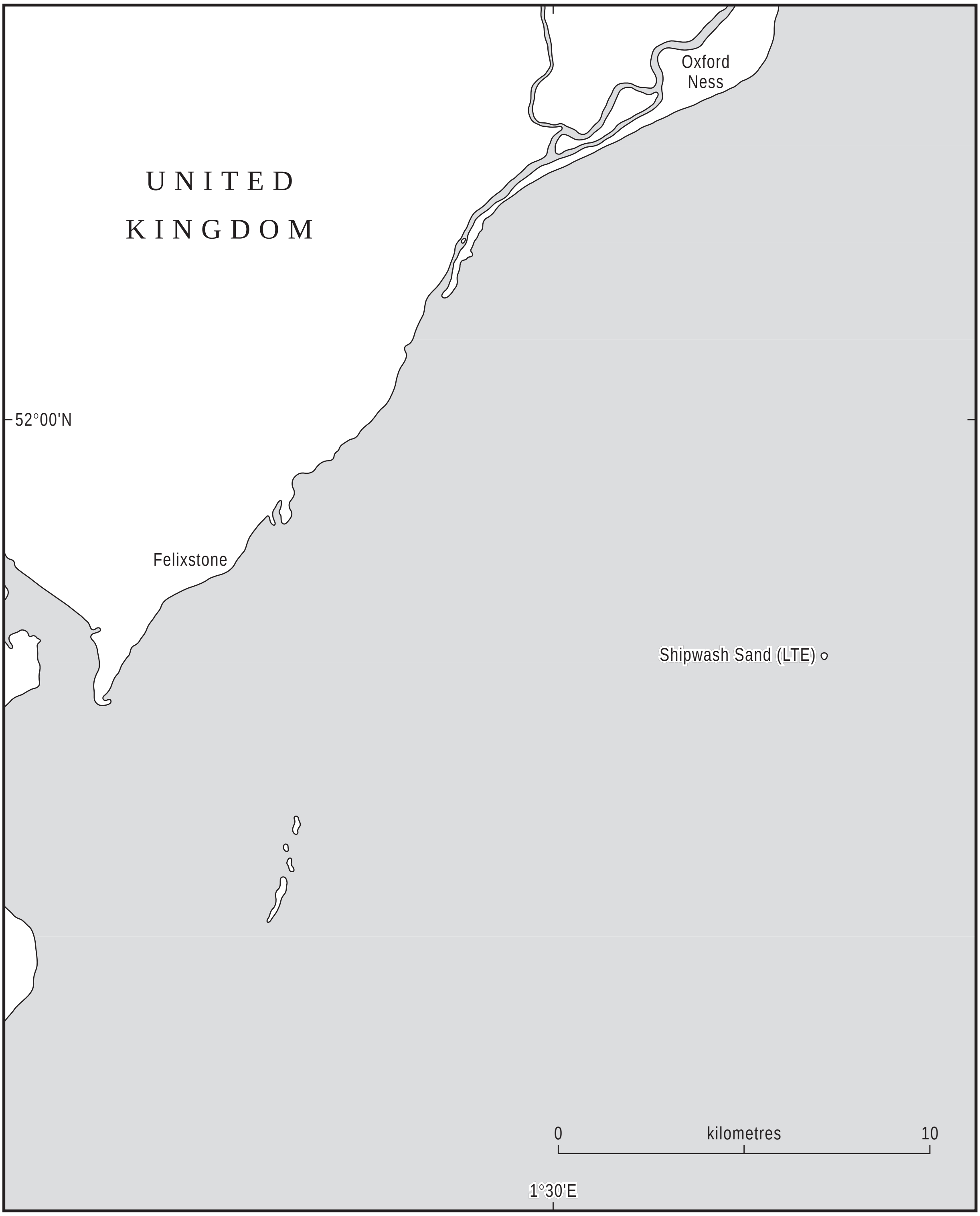


Appendix 3

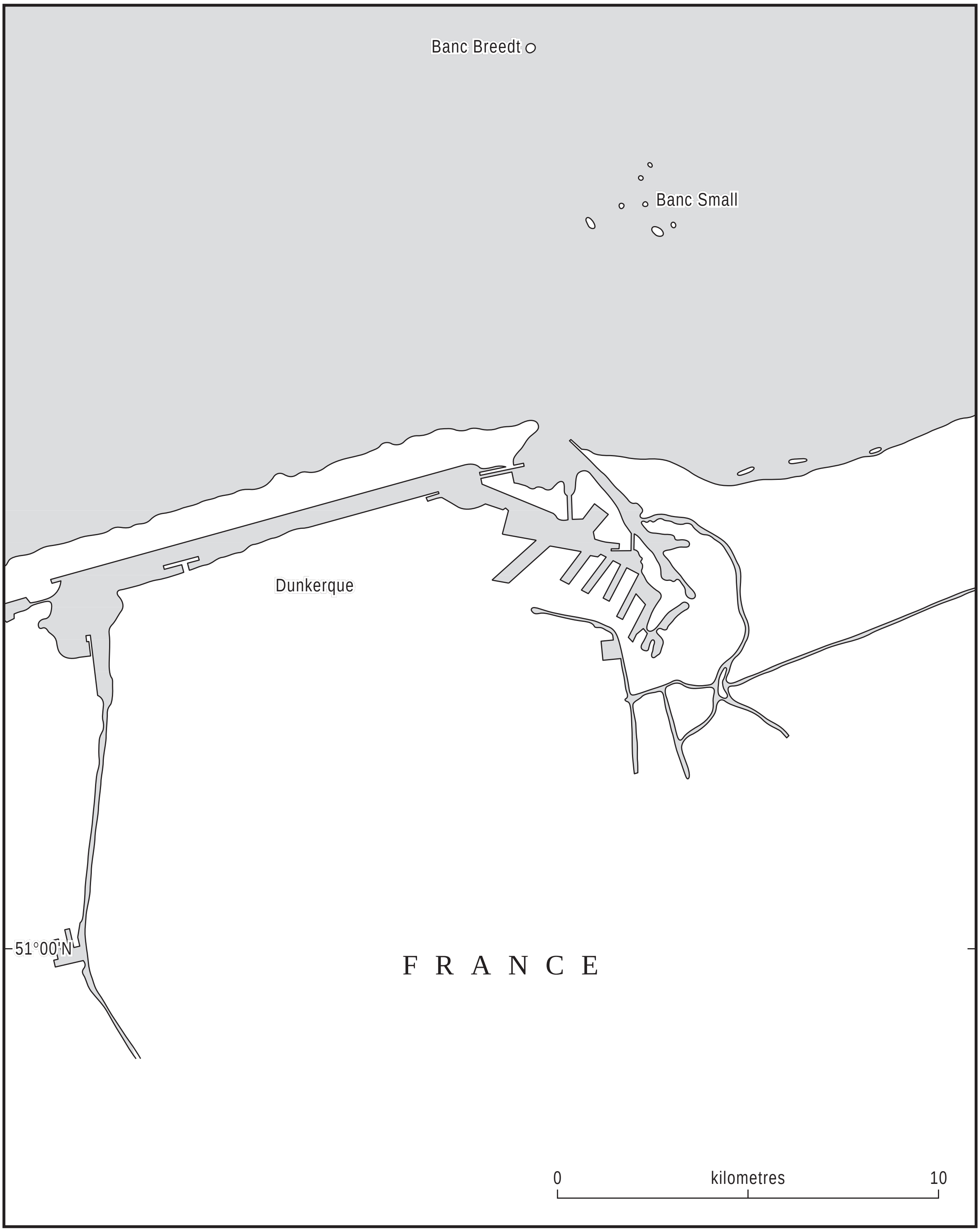
Reference Drawings
(The lines drawn in these charts are merely illustrative)



Drawing 1: Based on Admiralty Chart No. 1406
Chart Datum: approximately LAT
High-Water Datum: MHWS

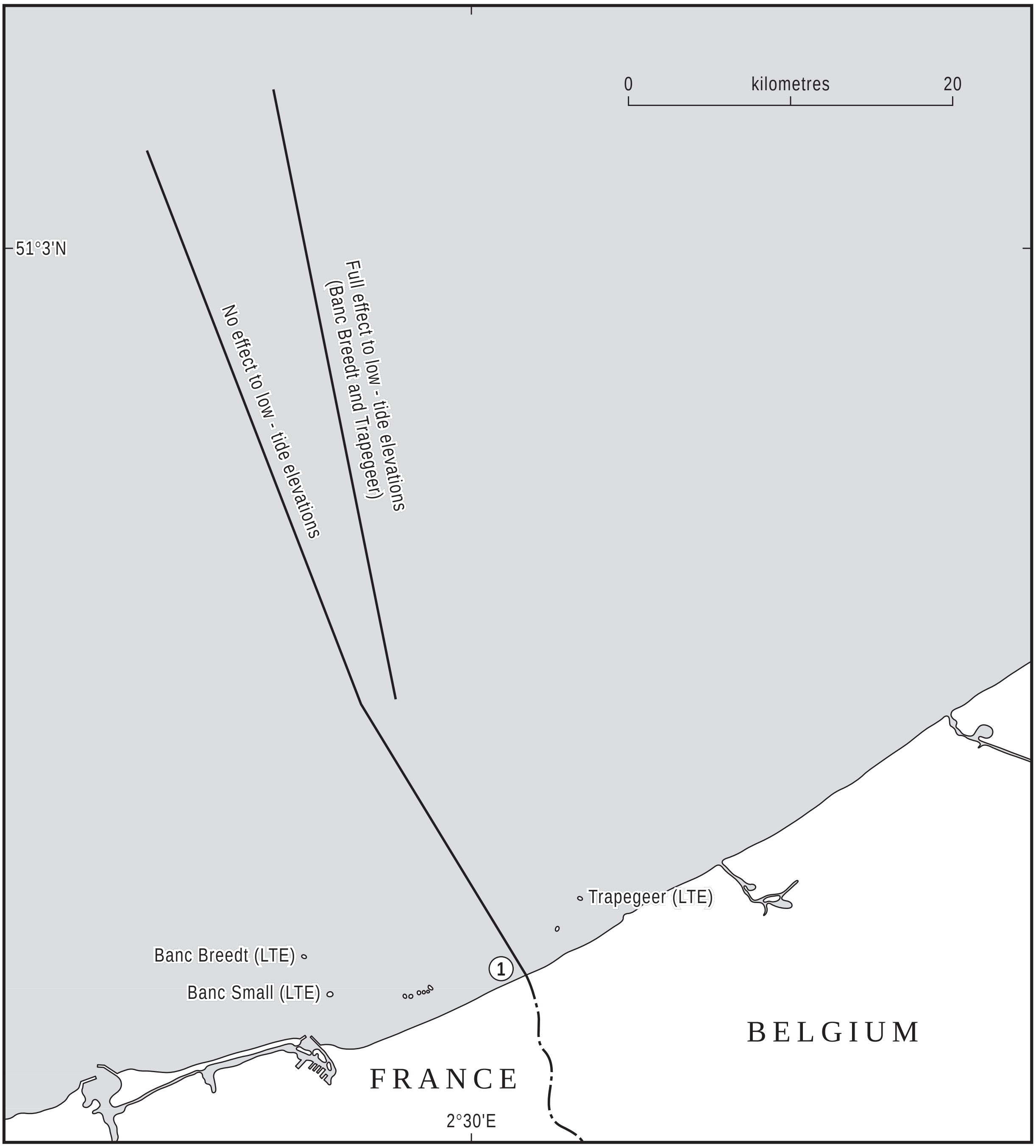


Drawing 2: Based on Admiralty Chart No. 2052
Chart Datum: approximately LAT
High-Water Datum: MHWS



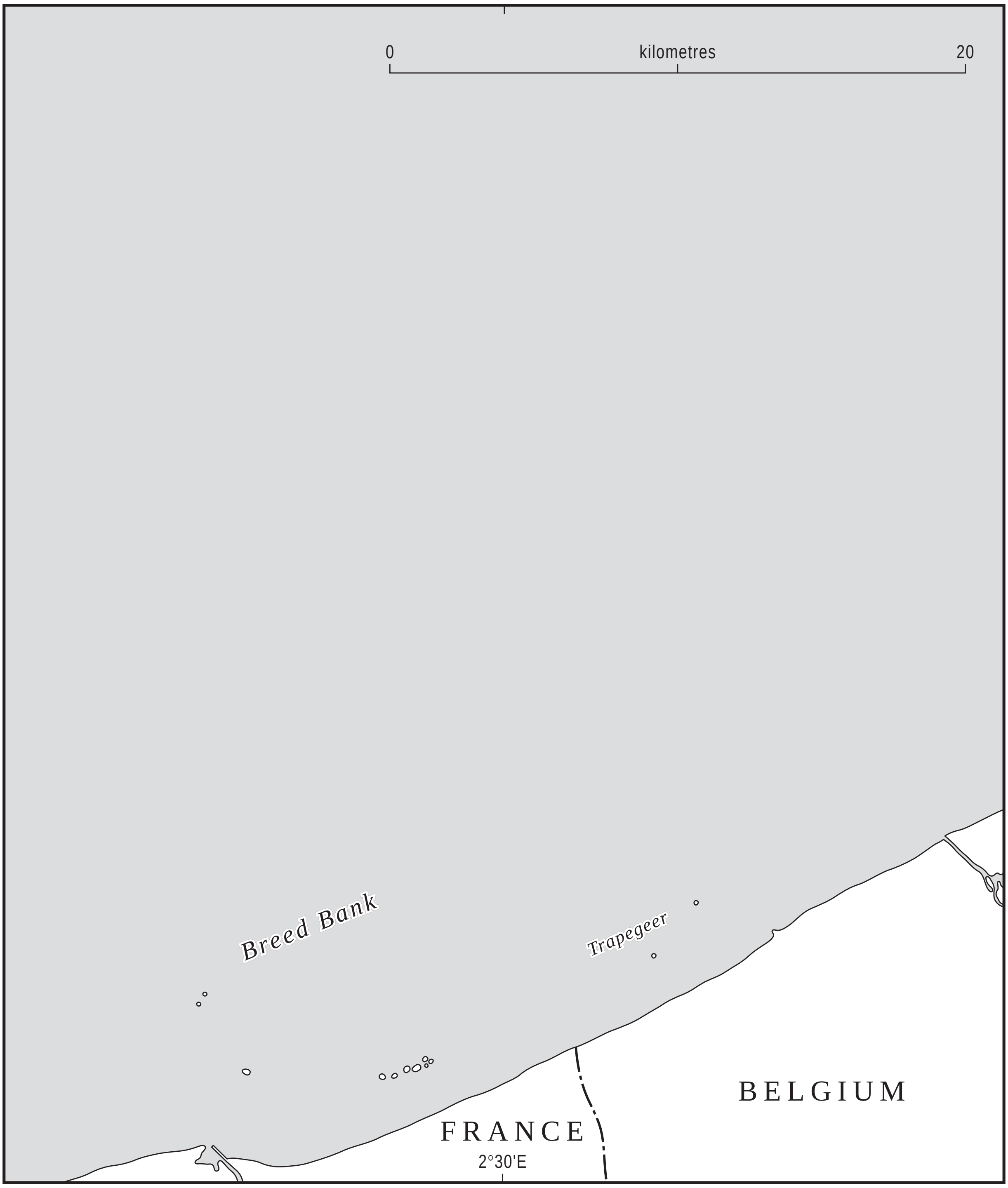
Drawing 3: Based on Admiralty Chart No. 1350
Chart Datum: approximately LAT
High-Water Datum: MHWS

Drawing 4: Based on Admiralty Chart No. 2449
Chart Datum: approximately LAT
High-Water Datum: MHWS



Drawing 5: Based on Admiralty Chart No. 1872
Chart Datum: approximately LAT
High-Water Datum: MSL

Drawing 6: Based on Netherlands Chart No. 1348
Chart Datum: LAT (UK), LLW (France), and MLtLWS (Belgium)
High-Water Datum: MHWS (UK) and MSL (France and Belgium)



Drawing 7: Based on Belgium Chart No. 102
Chart Datum: MLtLWS
High-Water Datum: MSL